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CHILDHOOD PRODIGIES AND ADULT GENIUSES

(See "The Childhood of Genius" page 145)

Hereditary Adiposity in Mice
C. H. Danforth

The Origin of the Garden Strawberry
A. J. Mangelsdorf

Familyculture—A Pioneer Eugenics Journal

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THE WORLD'S BRIGHTEST BOY—?

Frontispiece

Goethe at the age of fifteen. "His IQ may in the history of mankind have been equalled in a few instances, one may well wonder whether it has ever been excelled." From the facts which are known of Goethe's childhood he is credited with an Intelligence Quotient of 180, which means that at five years of age he was as far advanced as the average child of nearly ten. When he was twelve he amused himself by planning and sketching out a novel written in seven languages.

THE CHILDHOOD OF GENIUS

A Review

GIRL PRODIGIES

Figure 1

George Sand who "wrote twice as much in a week as others in a month," and Madame de Stael are among the eight women included in this list of geniuses, who showed great promise in childhood. By the time they were fifteen both were prolific writers.

WHO was the brighest child that ever lived?

Every parent knows the answer. Others will profit by the study which Catherine B. Cox,* has recently completed.

For many great men, the facts of early life have not been sufficiently recorded. So far as the records go, it rather looks as if the palm must be awarded to John Stuart Mill, the English economist. He "had no childhood; his interests and activities were mature from the first." He began to learn Greek at 3; was reading Plato at 7. At 9 he mastered conic sections, and the rest of his youth was cut from the same pattern.

The facts seem to warrant assigning to him an Intelligence Quotient (the ratio of mental age, as measured by achievment, to physical age as measured by the calendar) of not less than 190.

But since the IQ to be assigned to these early geniuses depends largely on the amount of information available, backers of other candidates can make

**Genetic Studies of Genius* (ed. by Lewis M. Terman), Vol. II. *Early Mental Traits of Three Hundred Geniuses,* by Catharine M. Cox. Pp. 842. Stanford University Press, 1926.

CHARLOTTE BRONTÉ—ONE OF A GIFTED FAMILY

Figure 2

The three Bronté Sisters, Anne, Emily, and Charlotte were all gifted writers. Charlotte's *Jane Eyre*, considered her greatest work, was published when she was thirty-one. All through her childhood she had filled many volumes with stories written in an almost microscopic rand.

Would it have been possible by psychological tests to discover the Bronté Sisters, and by encouraging their natural endowments to have doubled their gifts to the world? The belief that something of this kind would be possible underlies the Stanford University scheme for the development of genius.

out cases for their own favorites. Several others are rated by Dr. Cox, and those who assisted her, at 180 to 190; hence if more facts were to be had they would very likely equal or exceed John Stuart Mill.

Infant Prodigies

Jeremy Bentham, the English jurist and utilitarian philosopher, comes in this group. He learned the alphabet before he could talk; at 4 and 5 he was writing little compositions in Latin and Greek; at 10 he was ready to enter Oxford. "Before he was 3¼ Jeremy took a walk with his parents and some friends, and finding that the conversation was about matters of indifference to him, he escaped and ran home. Ringing the bell, he gave orders to the footman to put the reading desk on the table and place a large folio, Rapin's *History of England*, upon the desk, and to provide candles without delay. His parents came home to find him absorbed in his reading."

Thomas Babington Macaulay, the English historian and statesman, is famous for his precocity. At 3 he read incessantly; at 4 he carried away a mental catalog of the Oxford col-

DULLARD AND BRILLIANT GENIUSES

Figure 3

Faraday (left) was not an unusually bright child, being credited with an IQ of only 125. John Stuart Mill, on the other hand, began the study of Greek at three, and had mastered conic sections before he was ten. Whether the dynamo or "Political Economy" is the greater contribution to human knowledge might be debated, but there is no question which is most extensively used today.

lection after a single visit to it. Before the age of 7, he wrote a compendium of universal history, from the Creation down; within a year or two more he had written a long heroic poem, a discussion of the merits of Christianity, and other articles too numerous to mention.

Blaise Pascal, French geometer and philosopher, falls in the same class. He practically created mathematics for himself, because his father tried to prevent him from studying them until after he had mastered the languages. He "wanted to know a reason for everything"—a characteristic that parents in general will recognize as significant.

Johann Wolfgang Goethe stands perhaps a little higher, even, than the youths just mentioned. In early manhood his achievements were so great that Dr. Cox, who is evidently an admirer of the German thinker, holds that his "true IQ may in the history of mankind have been equalled in a few instances; one may well wonder whether it has ever been exceeded."

Hugo Grotius, founder of international law, comes close to Goethe in the promise of childhood. Gottfried Wilhelm Leibnitz, the German philosopher and mathematician, is their worthy rival. "Grotius, Leibnitz, and Goethe, three universal geniuses, the evidence of whose overpowering intellect appeared and was recognized in earliest childhood as it was later in youth, are doubtless among the greatest minds with which this study is concerned. A minimum childhood IQ for these cannot be less than 180. A maximum is probably close to the maximum for the human race."

Yet even these do not exhaust the possibilities. Voltaire, Mirabeau, Berke-

CHILD PRODIGIES WHO ATTAINED EMINENCE

Figure 4

Pascal and Voltaire both probably had IQ's in the neighborhood of 200. Pascal showed a genius for mathematics at an early age in spite of parental opposition (or perhaps because of it!). Voltaire early exhibited the remarkable facility in making verses which characterized him in later life.

MEDIOCRE GENIUSES

Figure 5

The data available give La Fontaine (IQ 100) and Captain Cook (IQ 105) childhood intellects little above the average; in accomplishment both must be classed as exceptional men. The IQ measures only intellectual brightness, and many other qualities of mind go into the making of outstanding ability. The intelligence quotient is considered to be inborn, but we know little about the part played by heredity in determining other mental traits.

HUGO GROTIUS AT FIFTEEN

Figure 6

Grotius, the founder of International Law, is one of the trio of universal geniuses (Goethe and Liebnitz being the other two), "whose overpowering intellect was recognized in earliest childhood." "In the annals of precocious genius there is no greater prodigy on record than Hugo Grotus who was able to make good Latin verses at nine, was ripe for the University at twelve, and at fifteen edited the encyclopedic work of Martianus Capella." His acquaintance with International Law began at fifteen when he took part in a special mission sent to Paris by the state of Nassau.

ley, Davy, Melanchthon, Schelling, Arnauld, Comte, Laplace, Leopardi, Michaelangelo, Newton, the younger Pitt, Sarpi, Wolsey, and others are handicapped by the paucity of information concerning their childhood. If the facts were known, Dr. Cox thinks they might well have ranked, as those already named would probably have done, at 200 or above. At the age of two, they were as far advanced as the ordinary child of four; at five, they equalled the accomplishments of the average ten-year-old; and so on.

There are still others whom the book does not mention. L. M. Terman* called attention some years ago to the case of Francis Galton, the founder of eugenics, whose childhood IQ, as judged from facts given in the biography by Karl Pearson, can not have been much short of 200.

Such cases are indeed rare, yet since the art of mental testing became popular in recent years, a few parallels have been found. One girl, who is still in school, has even been assigned by competent students an IQ of 214—the highest on record. Will she, a generation or two hence, be estimated far above Charlotte Bronté, George Eliot, Mrs. Gaskell, Mme. de Maintenon, Harriet Martineau, George Sand, Mme. de Sévigné, Mme. de Stael—the eight women included in this list of 301 geniuses?

Dr. Cox thinks that anyone with a childhood IQ above 150 is certain, barring accidents, to show "superior adult performance"; but of course, the attainment of eminence depends on much besides the mere intellectual brightness which is the principal thing measured by the IQ.

Dullard Geniuses

Some of the great men of history have not been extraordinarily brilliant intellectually; and some of those recorded in this study seem to have had childhood IQs not much above mediocrity (i.e., 100); although it must always be remembered that if more facts were known, the IQ would probably be higher. Thus the study does not pretend to say what the true IQ of each individual was; it merely states what IQ is necessary to account for the facts, so far as they are known.

At the bottom of the list are LaFontaine, Messéna, and Vauban, with IQs of only 100. A step higher (105) one finds Bunyan, Cervantes, Cobbett, Cook, Copernicus, Drake, Mehemet Ali, Poussin, and St. Cyr, together with such a real genius as Michael Faraday. The list of IQ 125 begins with Joseph Addison and ends with George Washington; running through 30 others, including Liebig, Lincoln, Linnaeus, and Locke, to name but a single letter of the alphabet.

Every small college has numerous students with higher IQs than this, yet few small colleges will turn out a quartet of alumni who will accomplish more in the world than Liebig, Lincoln, Linnaeus, and Locke. The search for the further facts in the making of genius takes up much of the book, and leads to the following conclusions:

1. Youths who achieve eminence have, in general, (a) a heredity above the average, and (b) superior advantages in early environment. The factor last-named is by no means sufficient, as some have supposed, to account for their success, however; for there have been many other children, including the brothers and sisters of the geniuses, who failed to reach the same heights. On the other hand, an occasional genius arises from the most unpromising surroundings, as the son of a tinker (Bunyan), of a stonecutter (Canova), of a mason (Carlyle), of a strapmaker (Kant), of a day laborer (Cook), or of a peasant (Jansen). Nor will the early educational opportunities furnish the key to the problem, for those possessed by Winckelmann, Faraday, Lincoln, or Blücher were apparently

*Terman, Lewis M. "The Intelligence Quotient of Francis Galton in Childhood." *American Journal of Psychology*, Vol. 28, 1917, pp. 209-215.

not favorable to success. Heredity has the final decision.

2. Youths who achieve eminence are distinguished in childhood by behavior which indicates an unusually high IQ. Voltaire wrote verses "from his cradle"; Coleridge at 3 could read a chapter from the Bible; Mozart composed a minuet at 5; and so on. "The significant conclusion in the present study is that the extraordinary genius who achieves the highest eminence is also the gifted individual whom intelligence tests may discover in childhood. The converse of this proposition is yet to be proved."

3. "That all equally intelligent children do not as adults achieve equal eminence is in part accounted for by our last conclusion: youths who achieve eminence are characterized not only by high intellectual traits, but also by persistence of motive and effort, confidence in their abilities, and great strength or force of character." Since the IQ is, so to speak, inborn, it is in these last respects that education has its principal opportunity to produce good citizens.

In a summary review, it is impossible to indicate more than a small part of the great body of material, all treated in a rigidly scientific fashion, that this fascinating book contains. The eminent persons it describes were selected objectively, on the basis of J. McKeen Cattell's well known list, which was reduced by the deliberate elimination of all members of royalty and hereditary nobility (on the ground that the scales might have been weighted in their favor) and by the unavoidable elimination of many others about whose childhood little or nothing was known.

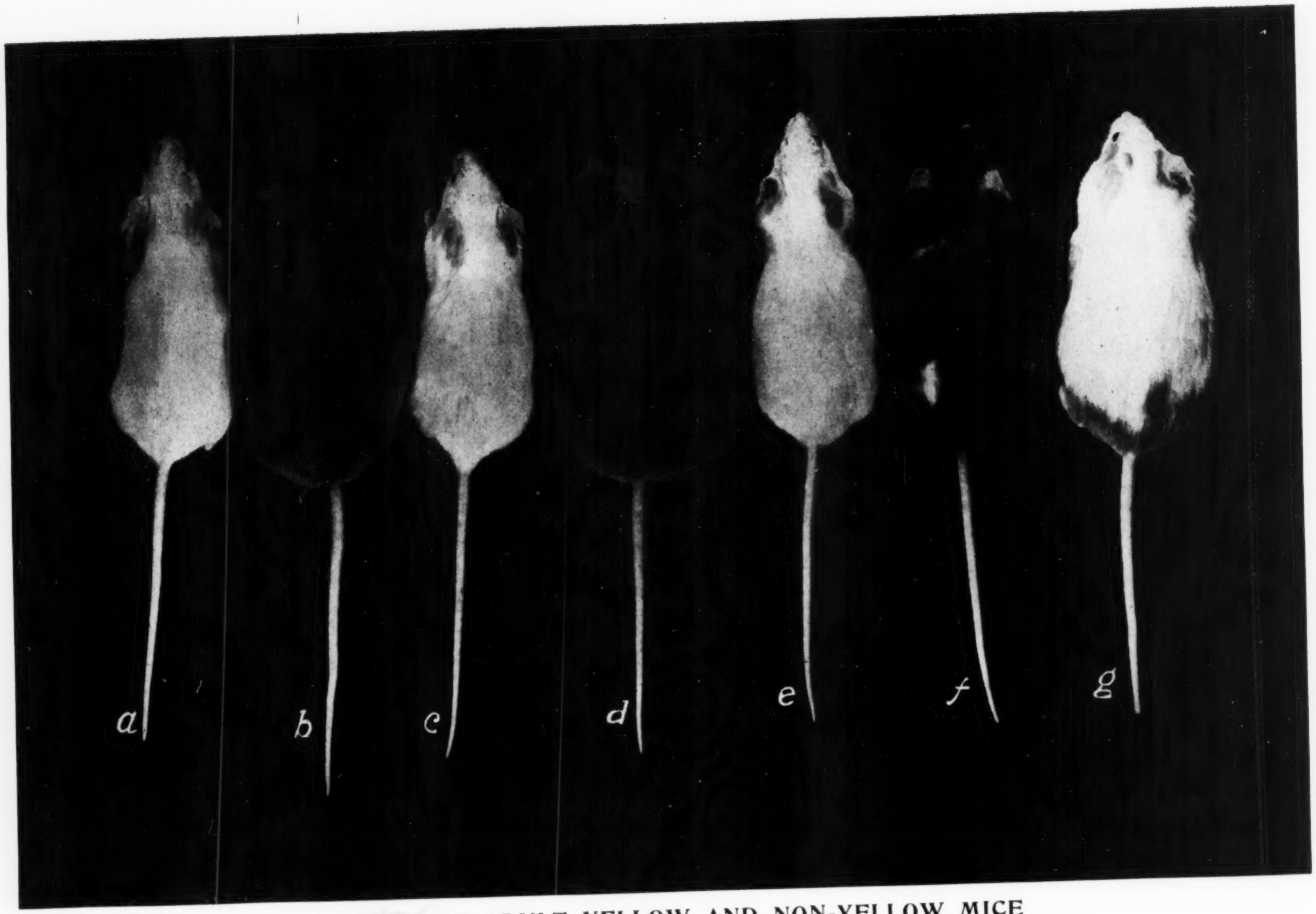
Objections and difficulties are met frankly, and the author is probably justified in concluding that what holds true of the individuals here studied will, in general, hold true of all men and women of genius. "Heredity sets limits, but within these limits the adequate training of the most gifted—and so also of their less distinguished fellows—may raise them to the designed stature of men unmarred by the defects of insufficient experience, and thus realize in each one the complete development of inborn worth."

Paul Popenoe.

The Kirchheimer Bleeder Families

Of fifty-two families descended from the Mampel bleeder family, hemophilia is found in only twelve. Klug makes some corrections in Lossen's figures. He finds only one true bleeder marriage (marriage between bleeder and transmitter). In the hundred years during which this family has been known in the medical literature, the disease has never appeared in females or been transmatted by males or from grandmother directly to grandson. In regard to transmission by males, Klug remarks that most of the bleeders have died too young to have progeny. His statistics show, in the males, twenty-seven bleeders, thirty-nine nonbleeders; in the fifty-eight females, fourteen transmitters and ten nontransmitters, the rest of the female members of the bleeder branches of this family either died young or are childless up to the present time. The presence of nontransmitting females in this family goes far to prove the validity of Bauer's application of Mendel's law to hemophilia.

Journal of the American Medical Association.



A GROUP OF ADULT YELLOW AND NON-YELLOW MICE

Figure 7

a a black-eyed white female, weight 27.5 grams; *b*, a yellow female, weight 55.5 grams; *c*, a pink-eyed white female, weight 24.0 grams; *d*, a yellow female, weight 67.5 grams; *e*, a black-eyed white male, weight 32.5 grams; *f*, a yellow male, weight 42.0 grams; *g*, a yellow and white male, weight 46 grams.

HEREDITARY ADIPOSITY IN MICE

C. H. Danforth,

Department of Anatomy, Stanford University.

Breeders have occasionally noted a tendency to adiposity in yellow mice, but thus far no one seems to have given much attention to this trait. Hereditary adiposity is of importance, however, not only for the geneticist, but for the bio-chemist, since mice with this characteristic are probably the only mammals known at present which, in the same cage with littermate controls, can be depended upon to develop an excess of fat without the intervention of any operative procedure or special dietary regime. Adiposity is of further interest since it furnishes readily available material to illustrate the interaction of hereditary and environmental factors in the production of a hereditary trait. The present fragmentary report is intended to do little more than draw attention to this interesting character, upon which further work must be done.

The material studied has come from a stock obtained originally by mating a few yellow males to females of various colors. Some of the descendants in later generations were yellow, others were not. The yellow ones were characterized by a marked degree of obesity*, developed soon after maturity, which differentiated them clearly from other mice, whether related or not. While this trait appears in both sexes, it is more marked in females† which occasionally attain a weight three times as great as normal adults of other strains. More frequently yellow females are about twice as heavy as others. A few yellow and non-yellow representatives of both sexes are shown in Figure 7. These specimens were etherized, then photographed, and weighed immediately. In Figure 8 one yellow and one non-yellow individual of each sex has been laid open to show the immense amount of fat which is deposited around the viscera of the yellow mouse. The subcutaneous fat is equally excessive. There is possibly some increase in other tissues, but this point needs further study, as does the question of fat within the different organs.

The Relation of Adiposity to Yellow Color

Since this pronounced adiposity was first observed in mice which were yellow, the question naturally arose as to whether or not the condition is necessarily associated with that color and experiments were made to test this point.

The genetics of yellow in mice has been extensively studied by a number of investigators‡, and its relation to other colors is now fairly well known. Yellow has been found to be epistatic to all the other self colors. The gene for dominant spotting usually restricts it somewhat, the homozygous genes for recessive spotting restricts it considerably more, and a combination of both these genes nearly, but never (?) entirely, eliminates it from the pelage. Ordinary albinism completely suppresses it. Its expression is also modified by a number of other factors which have given rise to such designations as sooty, black-and-tan, cream, and orange. All studies thus far reported seem to indicate that the principal gene, usually

*Briefly reported by the writer in the *Anatomical Record*, vol. 29, p. 354. 1925.

†While the male is generally larger in the Muridae, this is not always the case, even in wild species, as exemplified by *Peromyscus polionotus* (Summer; *Journal of Mammalogy*, vol. 7, p. 149. 1926).

‡Most of the important papers in English are scattered through the last eight or ten volumes of the *American Naturalist*, *Genetics*, and the *Journal of Genetics*.

a a black-eyed white female, weight 27.5 grams; *b*, a yellow female, weight 24.0 grams; *c*, a pink-eyed white female, weight 35.5 grams; *d*, a yellow female, weight 67.5 grams; *e*, a black-eyed white male, weight 32.5 grams; *f*, a yellow and white male, weight 42.0 grams; *g*, a yellow male, weight 46 grams.

MICE LAID OPEN TO SHOW THE FAT ABOUT ABDOMINAL VISCERA

Figure 8

These are four of the mice shown in Figure 7, arranged from left to right as follows: *a,* black-eyed white female; *d,* yellow female; *e.* black-eyed white male; *g,* yellow and white male.

designated as A^y, is the same throughout the series and acts as a lethal when homozygous. Consequently all yellow mice are heterozygous and produce some yellow and some non-yellow young irrespective of how they are mated. This enables one to readily obtain inbred yellow and non-yellow littermates after any desired number of brother and sister matings.

The first step in testing the heredity of obesity was to compare weights of yellow and non-yellow individuals from the same litter. If adiposity and yellow color were due to independent genes in different chromosomes, the non-yellow young should become fat as often as the yellows; but they do not. If there were a gene for adiposity and another for yellow, both located in the same chromosome, the ease of demonstrating the fact would depend on the closeness of linkage between the two genes. One might expect if such were the case, that there would be an occasional cross-over*, especially since A^y probably belongs to a series of allelomorphs, the other members of which do cross over. If such a crossing-over between A^y and a possibly distinct gene

*Cf. papers on linkage in rats and mice by Dunn, (Genetics, vol. 5, p. 149. 1920) and the important work of Detlefsen and Castle and their collaborators, appearing mostly in later numbers of the same journal.

for adiposity were to occur, there should be some lean yellow mice and some fat ones of other colors. But there have been no persistently slender yellow mice in which all question of pathological involvement could be definitely eliminated; and while fat mice sometimes occur "spontaneously" in other strains (and can be produced by operative procedure), none of these have appeared among the non-yellow descendants of yellow ancestors. Although these statements are based on only about two hundred fully adult individuals, which is not enough to definitely eliminate the possibility of linked genes—if indeed such a possibility can ever be entirely eliminated—the presumption is strong that only one gene is involved, and until evidence is obtained to the contrary, it may be assumed that it is the A^y gene itself which is responsible for adiposity.

The several yellow mice which failed to develop obesity cannot be counted as evidence for the crossing-over of genes because instead of being of normal weight, as would have been expected if crossing-over had occurred, these specimens were exceedingly thin. Such mice can be paralleled by sickly individuals of other strains, and it is probable that their condition was due to one or another of the maladies to which mice are susceptible. Nevertheless it is just possible that their emaciated condition was due not so much to external factors as to some inherent lack of metabolic stability in mice with the A^y gene. This is a question which needs to be definitely answered. It may be mentioned in passing that thus far all the individuals kept under controlled conditions have run true to form; the few puzzling cases have been those with inadequate records.

A further test of the relation of the A^y gene to adiposity consisted in making a number of out-crosses designed to introduce A^y into several different genotypic combinations. In this series yellows of two or possibly three grades of intensity were secured, as well as sooty yellows, yellows with dominant spotting, with recessive spotting, with both types of spotting in the same individual, and, finally, various classes of albinos carrying the A^y gene. The results of these experiments have been briefly reported elsewhere.* Suffice it to say here that the appearance of adiposity followed very strictly the distribution of the A^y gene, irrespective of the particular combination into which it had entered. The results strongly support the conclusion that the A^y gene, in addition to being lethal when homozygous, and producing yellow hair (except in albinos) when heterozygous, also endows its possessor with a strong tendency to an excessive deposition of fat.

If it should subsequently transpire that the hereditary element which we now designate as A^y is in reality a complex of three units, one a recessive lethal, one a dominant color factor, and one a dominant gene for adiposity, it would not materially affect the situation. It would simply mean the introduction of two new terms, and the loss of a supposed example of multiple effects from a single gene. Such an eventuality is not likely.

The Development of Adiposity

One can not present an adequate picture of such a trait as adiposity without considering it from the viewpoint of anatomy, bio-chemistry, and genetics, three sciences which must ultimately combine in a joint attack on some of the problems which they now attempt to solve independently. Here it is hoped only to indicate in a very general way how this hereditary trait manifests itself. It is not present at birth, nor does it often become apparent until after puberty. From then on its development is clearly indicated by the typical weight curves shown in Figures 9 and 10.

The derivation of data for constructing these curves may be outlined

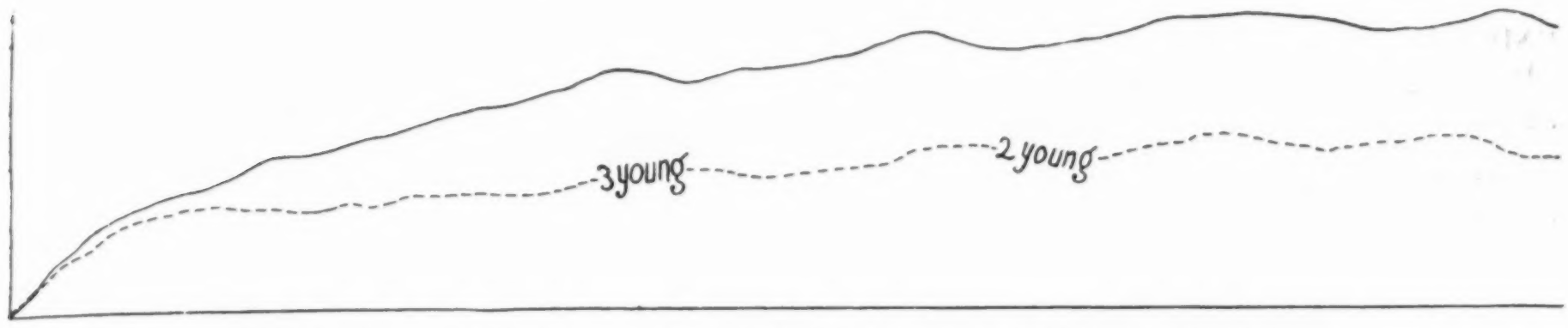
*Proceedings of the Society of Experimental Biology and Medicine, vol. 24, p. 69. 1926.

in some detail. In the first case (Figure 9) the experiment was begun by mating a yellow female to a yellow male. The female was then isolated and given what was presumed to be an adequate diet and favorable surroundings. She produced (Aug. 10, 1924), nine young of which five were males. The latter were immediately discarded. The four females which remained were given distinctive marks on ears and tails, weighed, and returned to the nest. Subsequent weighings were made at frequent, but gradually increasing intervals. Three of the group proved to be yellow, the other black. One of the former escaped and one was used in another experiment. The two remaining, one yellow and one black, were observed for a period of 600 days. During this time they were always kept in the same cage and never in their whole lifetime were so much as twenty inches apart except for a few minutes now and then when they were being weighed. They were supplied throughout with an abundance of such food as was given to other members of the colony (cracked corn, oats, dog biscuit, lettuce, salt, and occasionally a little butter). The mother was removed on the 33rd day and an unrelated male was kept in the cage from the 231st to the 250th, and from the 356th to the 390th days. Throughout the entire period every effort was made to keep the external conditions favorable and, so far as these two mice were concerned, absolutely identical. Nevertheless the two weight curves are quite different. At birth the black mouse weighed 1.440 grams, the yellow one 1.325 grams. On the fifth day the black one weighed 3.115, the yellow one, 3.020. by the tenth day the yellow one was .17 gram heavier, and by the twentieth day it surpassed the black one by .98 gram. When a month old the yellow one weighed 16.40 grams, the black one only 14.04 grams. At two months they weighed 23.5 and 20.0 grams, respectively. From this point on the relative trend of their weight curves can be followed from the figure. At the end of 600 days the yellow mouse weighed 55 grams, the black one 32 grams. The fact that the black mouse produced three young as a result of the first mating and two as a result of the second, while the yellow one did not produce any, is the only known point of difference in their whole life histories. Whatever the reason for this difference, it is clear that the production or non-production of young in this case did not appreciably alter the trend of the two curves. Figure 11 shows these two mice when about a year and a half old.

The upper curve in Figure 9 might suggest that the yellow female was sterile, which was possibly the case. However, the question of sterility in the yellow mouse presents several interesting ramifications which cannot be followed up at this time. As a rule yellow females probably produce fewer litters than do representatives of some other strains, and they also cease to reproduce at an earlier age. This may be due in part to purely mechanical effects of the fat. On the other hand, when they do have young, they usually have large litters, nine to twelve being common, and they are excellent mothers, with an apparently abundant milk supply. Their capacity in the latter respect makes them desirable foster mothers for the young of less vigorous parents.

Two other curves of a similar sort are shown in Figure 10. In this case the father of the two subjects was a black mouse, heterozygous for recessive spotting, and the mother a yellow mouse which carried genes for both types of spotting. The subjects themselves came from a litter of seven females and four males. One was yellow and white, the other brown and white. They were mated three times, the yellow and white one producing two litters of eleven each, the brown and white one three litters of six, eight, and two (?) young. In other respects the conditions were identical with those in the previous experiment.

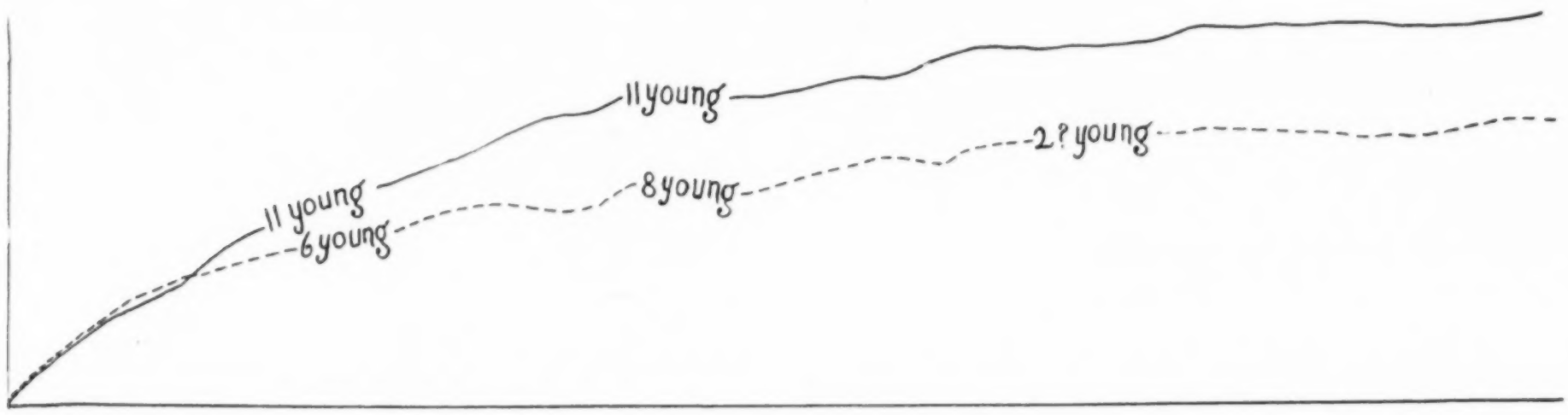
When seven days old the brown and white mouse weighed 4.860 grams,



WEIGHT CURVES FOR TWO LITTER-MATE SISTERS

Figure 9

The progressive weights of the larger yellow mouse are indicated by a solid line, those of her black sister by a broken line. The vertical line at the left represents 55 grams, and the horizontal line at the bottom stands for 600 days.



WEIGHT CURVES OF TWO LITTER-MATE SISTERS ON A NORMAL DIET

Figure 10

The solid line is for a yellow and white mouse, the broken line for one that was brown and white. The vertical line represents 73 grams, the horizontal, 560 days.

while the yellow and white one weighed only 4.425 grams. Nevertheless, in view of previous observations it was possible to predict on the basis of developing hair color that the latter would ultimately be much the larger. Such a prediction was indeed made at the time.

The results of these two tests, which are consistent with others conducted at the same time and subsequently, indicate the relative degree of adiposity commonly attained by mice having the A^y gene as contrasted with their litter mates which lack this gene. The experiments show clearly that with these animals it is neither the environment nor abundance of food that primarily determines the production of fat.

Adiposity and Albinism

It has already been pointed out that albinos carrying A^y become adipose as do other mice with this gene. This fact might need no special emphasis were it not that albinism is often taken very seriously by workers in other fields than genetics. Indeed the varietal name *albinus* is frequently applied to both rats and mice, and the worker is apt to feel that by the use of this term he has adequately characterized his material. But, although albinism undoubtedly involves much more than the mere lack of color, the term is after all rather non-commital. With reference to the genes relating to color the word "albino" fixes only one point, that the individual is homozygous for *c*, whereas "black," for example, tells us that the animal has both *C* and *B*, but does not have *A*, A^y, etc. In regard to such other traits as anemia* and adiposity "albino" is equally uninforming. While this is no argument against the use of this term when there is nothing any more explicit, it does suggest that the

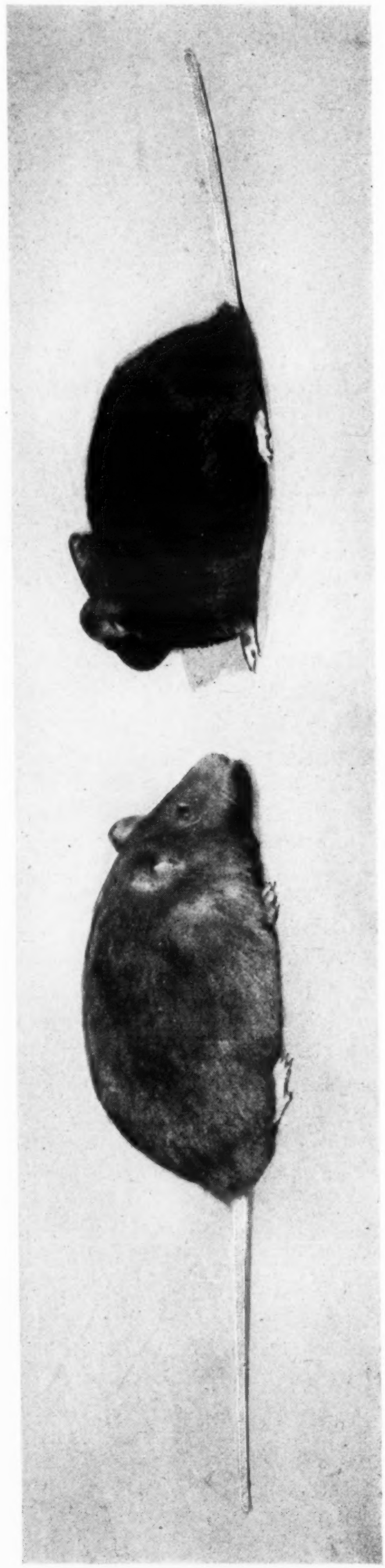
*S. B. de Aberle: Hereditary anemia in mice and its relation to dominant spotting, *American Naturalist*, vol. 59, p. 327. 1925.

experimenter should not too complacently classify all individuals as albinos and others.

In the present series the A^y gene has been carried in pure albino stock for several generations. Whenever it is desired to test for the presence of A^y it can be done very readily by mating the albino with a mouse of some color other than yellow. If any yellow young are produced it shows that the albino parent carries A^y. Such tests can often be made when the A^y individuals and their litter mates are of about the same size and practically indistinguishable. Drawing his material from such a stock, an unsuspecting experimenter might easily be misled by the apparently divergent responses of two seemingly identical, litter-mate sisters. Thus two albinos of albino ancestry for several generations were kept together from birth, except for a few days while they were having young and raising them to an age when the color could be determined. One was shown to carry A^y, the other not. When this test was made they were of about the same weight and of similar appearance, but four months later the one carrying A^y was more than twice as heavy as her sister. One may speculate as to what conclusions might have been drawn if these two apparently admirably suitable individuals had been used as subject and control in an experiment involving some special procedure! Characteristic poses of two such mice after their genetic differences have had a chance to manifest themselves are shown in Figure 12. The hump on the neck, shown there, is characteristic of mice with the A^y gene.

Utilization of the Excess Fat

Since on an ordinary diet mice carrying the A^y gene lay down much more fat than do mice without this gene, it is of interest to know if the fat is of such a nature as to be available in time of need. A few experiments have been made to test this point. The procedure followed was simply to put animals whose histories were fully known on a



TWO LITTER-MATE SISTERS, ONE BLACK AND ONE YELLOW

Figure 11

These are the mice whose weight curves are shown in figure 9. The picture was taken when they were about a year and a half old.

TWO ALBINO FEMALES AT THE AGE OF EIGHT MONTHS

Figure 12

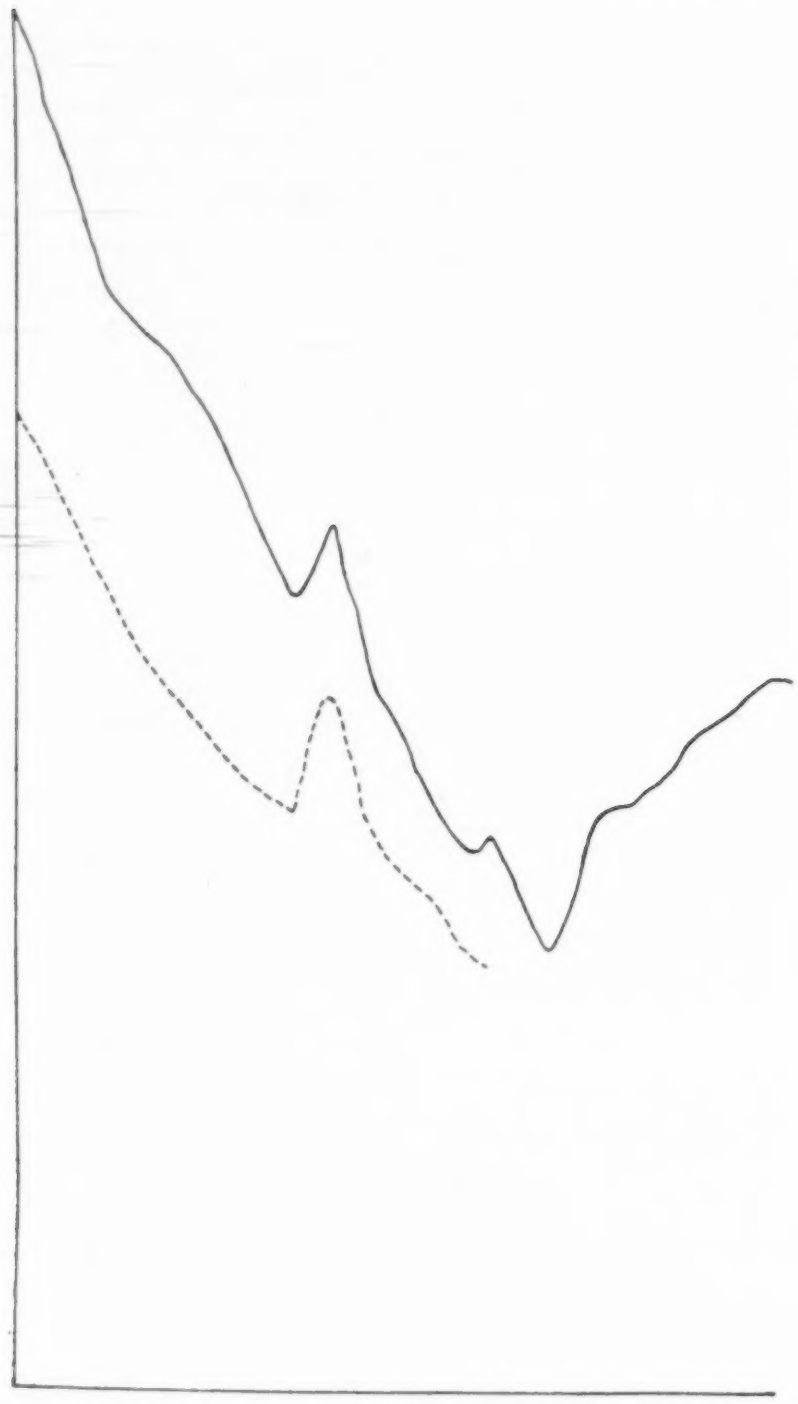
These were litter mates which had almost identical treatment throughout. The side view is slightly reduced, but gives the relative proportions. Had these two apparently identical mice been used as subject and control in an experiment to test the effect of environment, it is interesting to speculate on the results!

deficient diet, either lettuce or rice. In Figure 13 are represented the curves for two litter-mate sisters (the same used for the curves in Figure 10), which were kept for four weeks on a diet that, except for one day, consisted of lettuce in abundance, but nothing else except water. It will be seen that on such a diet the weights begin to fall promptly and that the slope of the curve is steep. In this instance on the twenty-eighth day the control animal had become comatose and was killed. During this period the yellow mouse had dropped in weight from 73 grams to 24 grams, a loss of 67 per cent. It was then returned to a normal diet and made a good recovery. The maximum loss thus far, followed by complete recovery has been 69.2 per cent. the curves in Figure 13 are reproduced in preference to smoother ones because they show the interesting effect of a return to the regular diet for one day (the fifteenth).

Autopsies on yellow mice kept for a considerable period on such a restricted diet show the abdominal fat-masses reduced to small pinkish strands, which are largely blood vessels and connective tissue. In a mouse which has shrunken to less than half its original weight the skin often presents a grotesquely baggy appearance.

The result of a similar experiment in which polished rice was used in place of lettuce is shown in Figure 14. The two mice in this case were not sisters. The control was two days younger, but both had been kept together in the same

The picture was taken when they were about a year and a half old. These are the mice whose weight curves are shown in figure 9.



WEIGHT CURVES FOR TWO PAIRS OF MICE ON A DEFICIENT DIET

Figure 13

These curves were made immediately after those in Figure 10, the same individuals being used in both cases. The vertical distance represents 73 grams, the horizontal 40 days. The short sharp rise in the descending part of the curves was occasioned by a single feeding of grain, the results lasted for some time. The right hand part of the curve shows the gains made by the yellow mouse during the first twelve days after a return to normal diet.

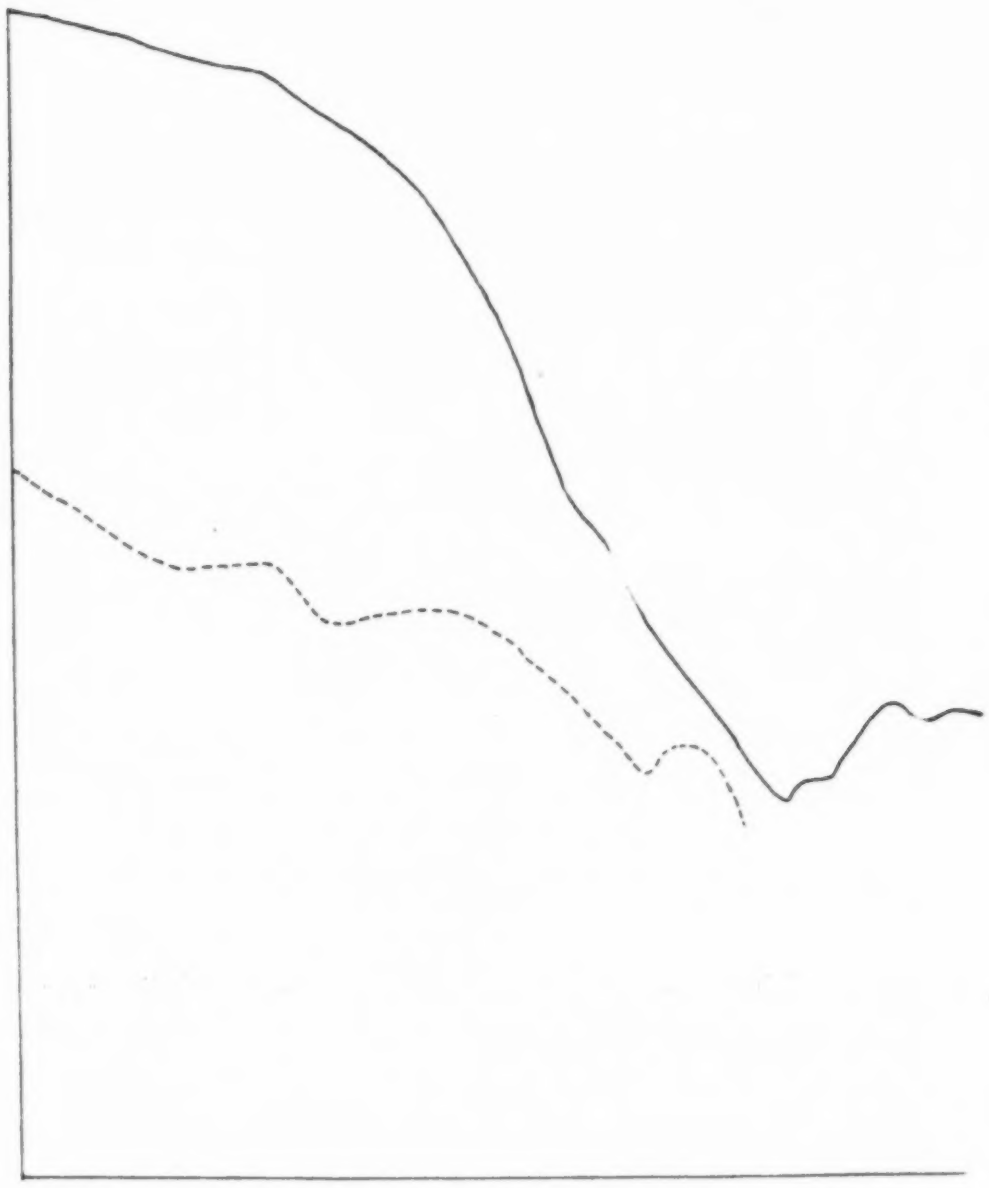


Figure 14

The solid line represents a yellow individual, the broken line a brown one of similar age and past history. In this case the vertical distance corresponds to 61 grams and the horizontal corresponds to 50 days. During the last ten days the yellow mouse was on a normal diet.

cage for over sixteen months. After 39 days on this diet the control had become weakened beyond recovery. On the 41st day the yellow one, having lost 67 per cent of its original weight, was returned to a mixed diet on which it made a good recovery. The form of curve for mice on a rice diet differs from that obtained when lettuce is used, but the experiments agree in the important point that in either case the A^y mice tend to outlast the others and can make a good recovery after most of their fat has been used up.

A great deal of work needs to be done along these lines before conclusions of much value can be drawn. From the data in hand it appears that the excess fat is stored in a manner to make it readily available in time of need. Whether it is of the same value, gram for gram, as the fat of ordinary mice remains to be determined.

General Nature of the Trait

A trait of this sort presents many points of interest. One may wonder if similar mutations may not have been an

important step in the evolution of hibernating animals—the appearance of individuals who in time of plenty can store in their own tissues material that may be utilized as needed in time of want. On the other hand one may ask if these families of fat mice are not closely analogous to those human families in which pronounced obesity also occurs as an hereditary* trait? But speculation along these lines is quite useless except in so far as it serves to suggest concrete questions for which definite answers may be sought.

With adiposity, as with a multitude of other traits, the real question is to explain the relation between a germinal condition and a somatic one—in short, what is the relation between A^y genes in the nuclei and fat in the tissues? At present the *whole* question is before us, but it may be expected that various phases of it will be solved from time to time and the field of attack gradually narrowed. It would seem probable that the deposition of fat in A^y mice is due to some functional peculiarity which in turn is dependent, through few or many intermediate steps, on the ultimate constitution of the germplasm. The best mode of attack may be the isolation and analysis of these steps one by one.

It is of interest in this connection that a number of ordinary mice with both ovaries removed have developed weight curves very similar to those ot unoperated yellow females. This in conjunction with the fact that the yellow females are possibly less fertile than others, and also even more obese than yellow males, might suggest that the ovary forms one link in the chain. But until spayed controls and unoperated yellow females can be fully compared, any conclusion to this effect would be hazardous. It is possible that the ovary and other members of the endocrine system are more or less involved in the production of the excess fat and these may have to be studied as one of the steps in the series, but at the same time it is not at all improbable that back of these is a controlling nervous factor which may perhaps eminate from the real anatomical expression of the A^y gene.

That there are other genes than A^y which have a slight influence on adiposity, increasing the weight of non-yellow mice and acting cumulatively in the yellows is a bare possibility suggested by observations which can not be reported at this time. If there be such other genes, it remains to determine whether they, along with the much more potent A^y, exert their influence on some particular organ or function connected with fat metabolism or whether their presence in the nuclei of areolar tissue cells makes these cells more active in the taking up and storage of fat. Perhaps it will require the cooperation of students in several fields to answer these questions satisfactorily.

From a purely didactic point of view a trait of this sort may serve to illustrate rather interestingly the interrelation between hereditary and environmental factors. Thus, under ordinary circumstances a mouse which carries the A^y gene becomes heavier than one which does not, but, by varying the diet, conditions may be made such that the reverse will be the case; or, again, by spaying the non-A^y individual both may be made to develop similar weight curves in identical surroundings. Further, since the trait does not appear until after birth, it presents another peculiarity which persons inexperienced in genetics often find difficult to associate with the idea of heredity.

Conclusions

In concluding this general account of adiposity in mice the following points may be enumerated by way of summary:

1. A pronounced form of adiposity, more marked in females, develops in certain mice at or subsequent to maturity and behaves in heredity as if due

*See Davenport: Body Build and Its Inheritance, Carnegie Institution of Washington 1923.

to a single gene which acts as a lethal when homozygous.

2. This gene seems to be identical with the one responsible for yellow color (A^y).

3. Its effect on adiposity is not influenced by albinism or other factors modifying color.

4. On an ordinary diet mice with the A^y gene lay down fat to an extent greatly in excess of control animals on the same diet.

5. Practically all of this fat can be utilized under adverse dietary conditions.

6. There are possibly other minor hereditary factors which influence adiposity to a slight degree.

The Blood Groups

DIE TECHNIK DER BLUTGRUPPENUNTERSUCHUNG fuer Kliniker und Gerichtsaertze, nebst Beruecksichtigung ihrer Anwendung in der Anthropologie und der Vererbungs—und Konstitutions—Forschung, *by* FRITZ SCHIFF, section director of the city hospital in Friedrichshain-Berlin. Pp. 66, with 28 illus., price $1.50. Berlin, Verlag von Julius Springer, 1926.

Simple and specific directions for dealing with the blood groups; colored illustrations. The author's formulæ are based on the assumption that the inheritance of the blood groups depends on a single pair of factors, although elsewhere he says that the supposition of three allelomorphs fits the facts better. He develops in detail the methods of application, such as in cases of disputed parentage.

P. P.

The Care of the Feeble-Minded

IT will come as a surprise to many that an association for the study of the mentally deficient could have been in existence for half a century. The Association for the Study of the Feeble-minded was originally organized in 1876, and its fifty-first annual meeting was held at Toronto, June 3-5, 1926. The report of this meeting has recently been published and it contains much of value not only to students of the feeble-minded, but to all who are interested in human progress.* An address by the retiring president of the Association gives an interesting history of beliefs regarding mental deficiency.

A majority of the papers deals with the diagnosis, care and treatment of feeble-mindedness. Several of them discuss the causes of mental deficiency, and its prevention.

R. C.

*Proceedings and addresses of the Fiftieth Annual Session of the American Association for the Study of the Feeble-Minded. H. W. Potter, M.D., Editor, Thiells, N. Y. 1926.

SOCIAL PROGRESS IN GREAT BRITAIN

T. D. A. COCKERELL
University of Colorado

ONCE in a while I receive the suggestion from an influential source that my hair needs cutting. But it is not so easy to follow the advice, for the barber shop is small and there are many young men hereabouts. Not only this, but the young women, in spite of having a beauty shop all their own, invade my barber's precincts and occupy his chairs. Thus it came about, in the middle of September, that I had to wait quite a long time for my turn. Taking up the *Saturday Evening Post* of September 11, I found an article of extraordinary interest, giving (page 206) a variety of statistics concerning progress in Great Britain since the year 1914. These were stated to be from official sources, and had every appearance of being authentic. Nevertheless, they were so remarkable that I copied out the most significant and sent them to my brother S. C. Cockerell, of Cambridge, asking him to find out whether they could be verified or should be discounted. He sought competent advice, and I am especially indebted to the well known economist Dr. J. H. Clapham for a critical examination of the whole series. The results are as follows:

(1) Deaths from All Causes per 1000 in the United Kingdom

	1914	1924
United Kingdom	23.9	19.3
England and Wales	23.8	18.8
Scotland	26.1	21.9
Ireland	22.6	22.3

The 1926 figures for Ireland include only North Ireland.

(2) Deaths from Tuberculosis

Great Britain	In 1914	57,994
	In 1924	46,756

On the other hand, deaths from cancer: 1914, 44,905; but 1924, 56,487. Thus cancer appears to have gone up, nearly in proportion as tuberculosis has gone down. No doubt this is largely due to two causes: (1) the greater number of old people, the expectation of life having advanced, and (2) the greater accuracy and frequency of diagnosis, especially of internal cancer. It is obviously impossible that such differences, in ten years, should be due to changes in the genetic composition of the population, nor is it easy to ascribe them to changes in habits.

(3) Deaths of Infants under One Year

Great Britain	In 1914	105,681
	In 1924	65,259

(4) Consumption of Spirits

In 1914	32,596,000	Gallons
In 1925	14,500,000	Gallons

Dr. Clapham comments: These figures include methylated. The home-made portable spirits, "retailed for home consumption" were:

United Kingdom	In 1914,	25,940,690 Gallons
	In 1924,	12,449,989 Gallons

He adds that this is nearly the same ratio of decline as in other figures, but the Irish Free State dropped out in the interval. He thinks that might add 2,000,000 gallons to 1924.

(5) Post Office Savings Bank Depositors

In 1914	13,514,000
In 1924	18,879,000

Dr. Clapham cannot verify those at the moment but supposes the figures correct. He adds, however, the following:

Amounts Due to Depositors at the End of the Year

1914	£169,377,170
1924	£558,863,997

(6) Hours of Labor

Before the war about 55.5 a week; now 48 a week.

Dr. Clapham adds a note on the increase of unemployment at the shorter hours. "This is not so stupendous as is popularly supposed (we enumerate

our unemployed far more carefully than we did in 1914), but there are certainly more of them, some hundreds of thousands."

I have not tried to look up the comparable statistics for the United States, as the case of Great Britain is really more striking, considering what that country has suffered and is suffering. In both countries the progress of the last few years has been far greater and more significant than people generally understand. In the current *Atlantic Monthly* there is an article by an historian, on our dissolving ethics. He concludes that our ideas and ideals are in the melting pot and that while we must face our problem with courage we really do not know which way to turn. This is only a sample of a sort of highbrow pessimism which is very prevalent, and has its influence throughout the country, perhaps especially among young people in the colleges. It is, I believe, one of the leading vices of the day, and the parent of other vices. It should be vigorously attacked by those who have been trained in scientific methods, and have in their hands the lantern to illuminate the path ahead. What broadly speaking, do we want? Is it not "abundant life," the full realization of our potential powers, individual and racial? Is that not what we are getting? We live longer, have better health, more wealth, and opportunities of many kinds undreamed of by our ancestors. How has all this come about? Through the development and diffusion of science and good will. It is inexcusable to say that we are merely drifting in the dark, that we cannot tell right from wrong, or sense from nonsense. Never before have we been so successful in elevating our conditions, in spite of colossal evils and stupidities. We shall make mistakes, many and varied, do what we will, but through all, we shall advance to better things. Superstition and ignorance will give way to knowledge, and if we make radical changes, as we certainly must, it will be in the full light of day and for well considered reasons. All this, unless the pessimists paralyze our minds and hearts, and deprive us of ability to rightly use our inheritance.

P. S.—The editor quotes a letter just received from England: "It is awful here now, at the moment there is no hope; business awful, every one anxious and all of us cold." I believe this is quite unduly pessimistic, but I should be sorry to be supposed to underrate the misfortunes of the English people or to maintain that in this country we are free from innumerable errors of taste, judgment and morals. But the striking thing is, that in the face of all these things both peoples have in recent years made great and significant advances, productive of lasting good. What I urge is this, that we should understand and appreciate these advances, attribute them to their true causes, and profit by the lessons they teach. Scientific men who understand these things better than others, should incessantly preach a gospel of courage and hope, while attacking the evils that exist with all their might. This is an entirely different attitude from that of the cynic, who sees only confusion and has no real philosophy.

T. D. A. C.

FAMILYCULTURE, THE SCIENCE OF HUMAN LIFE

A Pioneer Journal of Eugenics Published in Boston Thirty Years Ago

THERE was a prophet of eugenics who cried her message in the wilderness of 30 years ago, before the world was ready or the paths of science had been straightened to receive it. A journal that asserted the right of every child to be well born, a forerunner of THE JOURNAL OF HEREDITY, was published in Boston during the year 1896.

Mendel's law of alternative inheritance did not gain recognition till 1900, and most of the definite data that have given heredity a place among the exact sciences, were still to be collected. But even at that time many facts were well known that left no doubt of the importance of heredity and eugenics, though scarcely anybody but Galton had considered human heredity as a practical science.

The word eugenics was not current in 1896, but the idea was embodied in the word *familyculture*, formed after the analogy of agriculture, and defined as the "true science of human life," and the "culture of humanity." For those who object to eugenics as "highbrow," familyculture may be the best substitute that can be offered, and with the advantage of recognizing that eugenics essentially is a problem of family development, which too many writers overlook.

Scientific foresight and constructive originality must be admitted, not only in the undertaking of a journal of familyculture, but also in the treatment of many of the eugenic problems. The basic need of increasing and disseminating the knowledge of heredity was clearly perceived, while the responsibility of applying heredity to human betterment was enforced on practical, moral and religious grounds.

Many of these early arguments for eugenics are well stated and related to questions that are still pertinent. The purposes set forth in the first number of the journal were as follows:

Agriculture is a term which includes the science, the art and the process of raising the products of the soil. Culture is now applied to the development of any product to a state of perfection, especially by care through successive generations. Our choice varieties of vegetables and fruits have been secured through wise and careful culture over a long period. This successful culture implies a scientific study of three things: First, of the soil, the atmosphere and of everything which comes under the head of environment; second, of all the characteristics of the plant; and third, of the law or method of its growth. By means of the knowledge obtained through such study we have seen all our vegetable food products advance to a great degree of perfection, and we are all of us daily reaping the reward of the tireless efforts of agriculture in more palatable and nourishing foods.

Floriculture is a branch of agriculture. It is the culture of flowers, and through it we have seen the rose, the chrysanthemum, the pink and other blossoms developed in color, size and fragrance till they have become objects of wonderful beauty and attractiveness.

Those varieties of flowers which have been the objects of so much care and cultivation would hardly be recognized as belonging to the same family as the poor, imperfect things from which they were developed.

Thus we see how the evolution of plant life has been hastened by the knowledge and skill of man. For centuries it proceeded through the law of natural selection, subject to accident, slowly and surely from lower to higher forms. When the intelligence of man came it discovered the law of life as manifested in the plant, and easily overcoming adverse conditions, it did for the plant world quickly what it would have been a long time in doing for itself.

Stockculture is the culture of livestock, or domestic animals and fowls. Great progress has been made during the past few years in the development of fine breeds of horses, cattle, sheep, all animals upon which

man is dependent for food or service. So well understood now is the science of animal life that it is possible to produce any style of creature that may be wanted. Stock breeders work definitely for a cow which shall be valuable for beef, and produce the shorthorn stock. They work for an animal which will give an abundance of milk—a milkman's cow—and get the Holstein. The demand for butter calls for the rich milk of the Jersey, and so on.

In the same way the fast trotter for the race course, and the heavy draft horse have been developed.

Thus has man been able to work in the creation of higher and more beautiful and useful forms of animal life. He is co-worker with God in the act of creation. God and man working together have produced what God in nature never produced without the aid of man. Man has taken the possibility which God put into his hand and made it into an actuality. He has studied the laws of growth and the influence of environment and perfected the original pattern.

Familyculture is the culture of humanity. It implies a scientific study of human life in its physical, intellectual and moral aspects. It is based upon a knowledge of the science of life as it is manifested in the highest order of being. It has much in common with agriculture and stock culture, and may be very much aided by a thorough knowledge of them; but there are new elements which come in to add incalculably to the problem. The human elements of mind and soul are prime factors. Man has had the opportunity to play upon the plant and animal as passive objects, yielding to his judgment and his will. All human culture, on the other hand, must depend upon the acquiescence and co-operation of the being worked upon. Man is to take hold of himself, as he has taken hold of plant and animal, study the laws of his being and subject his whole life to the reasonable following out of those laws. Physically he has much in common with other animals, but his peculiar mental and moral development sets him apart from them and makes him subject to higher laws. So he has the task of learning the laws, both of his physical and spiritual nature and finding out how he can adapt them to each other.

Only by scientific family culture can we expect to see the human race develop into its possible beauty and strength. Nothing good ever comes through ignorance. Knowledge is the basis of all progress in human life. As soon as we find the right way in any realm and follow it there is rapid advance.

We have been moving with snail-like pace in all moral reform and doubting if it is possible to bring human life up to a very high grade. It is because we have not begun to study the problem from the standpoint of scientific knowledge as we study life culture in every other realm. The work is before us, waiting for the faith and the consecration and the courage of those who see its possibilities.

Every other movement of the last century has been leading directly up to this new movement for more perfect family relations. It is the inevitable result of the development of the spirit of republicanism, of the industrial independence of women, of the education of all classes and of the general awakening that is taking place.

It is the natural climax of all the organized reforms that have grown out of a study of human conditions and an observation of human wrongs.

It has come, in the fullness of time, to respond to the conscious need of the world of a true science of human life.

Much of the material in *Familyculture* would now be classed as social hygiene, though stress was laid upon the importance of developing the science of heredity to the point where more definite applications to eugenics could be made. A few extracts will show the advanced nature of the discussion:

Multitudes of people are going wrong from ignorance, both in marriage and out of it, who would gladly go right if they knew what was right. Much of what we call depravity is simply the natural and inevitable result of ignorance, and would disappear if careful instruction and scientific knowledge were given. Ignorance is darkness; truth is the light which dispels it. You cannot put out the darkness, but you can shine it out. An arc light, properly placed, has driven crime out of many a corner without the aid of policemen. Correct information regarding the social, moral and physical relations of men and women will drive out much of the evil of our time.

The science of human life, like every other science, must be based upon a knowledge of the laws which govern it and the facts which pertain to it. The reason that there are so many social problems confronting us is that human life has, as yet, been studied so little as a science. Politicians assume that a Presidential election is the all-important cause of or remedy for disturbed conditions. Superficial reformers fix upon some one evil as the main or sole originator of the social danger. Sociology is the science above all sciences and for which all other sciences exist and from which they gain their importance. How should a human being live? and how can human beings live to-

gether in peace and happiness? These are the two vital problems of the universe. They can be solved only after the most thorough search into every part of human existence. The physical phase of it must be understood, the intellectual phase must be investigated, the moral phase must be comprehended and the affectional phase must be analyzed. When we consider how little true scientific study has been put into all these matters is it at all surprising that physical weakness, intellectual inefficiency, moral depravity and affectional disaster are so prevalent? And is it any wonder that social unrest and evil prevail?

Oliver Wendell Holmes said something to the effect that most medical cases should come to a physician two or three hundred years before the patient is born, meaning that many of our diseases of today are due to ignorance or sin on the part of our ancestors. If we are suffering for the misdeeds of past generations and realize that fact, does it not become our duty so to study the laws of life and live accordingly, that our descendents may have no such charge to prefer but may indeed rise up and call us blessed? We cannot change the records of the past, but today we are writing perhaps the first lines in the history of a new life.

The question is frequently asked, which is the more important factor in the life of an individual, heredity or environment? Different investigators give different answers. Questions relating to these subjects are practical questions. In this age of reform, when so many people are devoting their lives to making or trying to make the world better, the effectiveness of their effort will depend entirely upon the extent to which their ideas are correct with reference to these questions.

If a disproportionate stress be laid upon heredity there will be lack of effort along the line of education and in making wholesome surroundings. If too little credit is given to heredity we shall waste much effort in working in wrong directions and attempting impossible things. To secure a maximum of good result we must understand the relative strength of the two influences. Such understanding can be brought about only by the most careful observation and experiment extending over a long period. No short-sighted, narrow view will avail. There must be an accumulation of vast numbers of facts, and these facts must be classified and compared. Perhaps there are few who possess the qualities necessary for scientific classification, but there are multitudes who have the opportunity and ability to make observations and experiments and to record the results of the same, and this is what we should all try to do. Human life is under our constant observation. We do not have to go away somewhere to study it. It is a matter of opening our eyes to see and our ears to hear. It is a matter of doing thoughtfully and with careful attention what we do now, for the most part, without thinking.

Now, whatever opinions we may hold in reference to another life as succeeding the event of death, all intelligent persons will agree that the duty that lies nearest to us is that we make the most out of this life—the most out of this body through which we apprehend life. It seems probable that when we have attained to a sufficient altitude on the ladder of progress to catch glimpses of eternal life, its methods will be found to be as much of a disappointment to us as was the Darwinian theory to the believers in the Jewish cosmogony, or as the Copernican system to the believers of the Ptolemaic conception.

By proper mating of the race all that is undesirable in character can be eliminated. Whatever theory we may hold in regard to heredity, common observation teaches us we are free within narrow limits, and that the course that we pursue in a given environment depends upon what we have inherited. This in nowise conflicts with any reasonable theological statements, but it emphasizes this —that the important thing is to be born aright.

We have no means of knowing where to place the limit in the march of progress, but in the fact that we have come so far on our journey from the worm there is hope and prophecy for the future. Projecting intelligence into the cultivation of the plants, what wonders have been accomplished. Among the animals what size and speed have been secured in a generation or two. These are object lessons for us. If these things are hints of the truth, the truth is important. The immensity of the importance of this matter will grow upon us as we allow our minds to think in this direction. Almost any sane and reasonably intelligent individual will assent to these statements, but at the same time will note the "lions in the way." But the magnitude of the task is a spur to early action.

If the public opinion can be elevated to comprehend the vital importance of marriage, the necessity for seeing to it that the candidates are fit for it, and the law will exercise as much caution and care as it does in selecting a soldier or licensing a pilot or naval engineer, more will be done to stop crime, pauperism and immorality than has yet been done by all the means resorted to.

In the pages of *Familyculture* are recorded also the formation of two societies. "The Scientific Familyculture Institute" was organized in Bos-

ton in March, 1895. The officers were, Mary T. Whitney, president; Flora S. Russell, M. D., secretary; Philip J. Peabody, L. L. B., treasurer. While not connected with *Familyculture* it was organized by the same group and had essentially the same purposes.

The other was the "Society for the Prevention of Hereditary Diseases." It was organized in New York City by a group of earnest individuals who set forth on an ambitious and high minded program of reform:

That people are coming into the scientific spirit and method in their living is indicated by some organized movements which have recently come into existence. Among them is a society of which the New York *Journal* writes as follows:

"A strange society has been organized in this city. A number of young men and women have banded together for a laudable purpose that may affect the world for ages to come—at least so they think.

"These people subordinate sentiment to science and reason. Their headquarters are in the Stewart Studio Building, at No. 65 East Fifty-ninth Street. The officers of the society are: Miss A. Barnard, president; W. Franklin Crockett, Jr., vice-president; J. D. Chauncey, secretary; Miss I. Fairfax, historian.

"The object of the members is best explained by an extract from the constitution:

"'We, the members of this association, believe it to be a crime against society and future generations for certain persons to marry.

"'We each solemnly pledge ourselves not to enter into any matrimonial alliance with any person whose family is subject to such hereditary diseases as consumption, insanity or the appetite for strong drink, knowing that such individual is responsible for the physical perfection of hundreds yet unborn.

"'ARTICLE 1. This association shall be called the Society for the Prevention of Hereditary Diseases. ARTICLE II. Its aim shall be the welfare of humanity and the prevention of the transmission of hereditary diseases.'

"When the pledge is taken the applicant for membership stands in the center of the room on a raised dais on which falls a brilliant light. With the Religio-Medica in one hand and an hourglass in the other, the novice stands repeating the solemn words of the pledge. Only one member has broken the pledge. Her picture is draped in mourning and turned with its face toward the wall.

"It will be seen that the object of the S. P. H. D. Society is purely humanitarian. It is the outgrowth of an idea which germinated in the brain of a young college girl, a student of cause and effect, who had noticed the evil results of many marriages where love was the ruling factor and prudence a captive and slave. She registered a vow similar to the pledge which binds each member of the society, and she proceeded to explain her reasons for so doing to some of her friends. She found a few kindred spirits who agreed with her views and a constitution was drawn up.

"The president of the society was seen by a *Journal* reporter, and said: 'We have twenty members. We tell all our friends about the society and find many in sympathy with us. We expect to increase our numbers soon. So long as I mention no names I may quote an instance of the self-denial which we are called upon to exercise. A young lady, one of our members, was very much in love with a young man who was taking a post-graudate course at one of our leading colleges. She told him that she intended taking the S. P. H. D. pledge, and he approved her course. He graduated subsequently an honor man, but broken down in health with that dread disease, consumption, staring him in the face. My friend has taken the pledge and intends to abide by it. You may imagine they are heart-broken, but, on the contrary, they are happier and more contented than the majority of those who have not suffered and endured triumphantly. I am sure that any reputable physician will tell you that not only is consumption hereditary, but contagious. Even a person of excellent constitution runs a great risk by coming in contact with consumption.

"'That the appetite for intoxicants is an hereditary disease can be doubted by few people who use their powers of observation. Anything which tends to improve the condition of humanity in general is of benefit to the nation. We are not Spartans, but we may approach the Spartan ideal.'"

A fatal difficulty with such undertakings is that they appeal chiefly to people who take the responsibilities of this world too seriously. It is difficult to find anyone without some possibly hereditary defect somewhere in the family, which can be taken as a sufficient cause for abstaining from marriage. For this reason we could hardly expect the Society for the Prevention of Hereditary Diseases to survive beyond the first generation. The same danger is present today, that eugenic considerations inhibit the marriage of really superior individuals while they have no effect in stopping the multi-

Familyculture.

"It is the right of every child to be well born."

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Familyculture.

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" A glory shines before me
Of what mankind shall be —
Pure, generous, brave and free."

Contents:

EDITORIAL.
NOTES: *What the Paper Stands For; Why Another Paper; Culture.*
WHICH ARE YOU? *Poem*
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"GOOD MOTHER," *Poem, by Herbert Whitney*
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FATHERHOOD, *Poem, by ~~Mary Wood-Allen~~*
FATHERHOOD, *By A. H. Lewis, D. D.*

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FAMILYCULTURE stands for the idealization of human nature, pronouncing it "very good," and pleading for its development according to natural law.

FIRST PAGE OF FAMILYCULTURE

Figure 15

The size of the Journal was 8½x12 inches, larger than shown here. The motto of Familyculture, "It is the right of every child to be well born," is noteworthy, as it prophetically claims a basic right at a time when the importance of heredity was generally scouted.

plication of stupid and indifferent weaklings.

After the publication of twelve issues *Familyculture* was discontinued. A small group were emphatic in the demand that it not be allowed to suspend publication, but interest in the subject was not general enough to make continued publication possible. The farewell editorial tells of hopes that could not be attained:

For just one year FAMILYCULTURE has lived its life and spoken its word to a few out of the millions of the world's population. If it is to breathe its last breath with this closing number of its first year, it can congratulate itself that it has been a momentous year in the history of the world's thought upon all the subjects upon which it has been more especially interested. This is unmistakably evinced by the organized movements which have sprung up and which have been noted from time to time in these columns. The two most notable to be mentioned are the Home Congress, which was held in Boston last October, and the National Congress of Mothers, held in Washington this present month. There could be nothing more fitting and certainly nothing more encouraging to close the year's work with than an account of the Washington Congress, and hence this will be, almost wholly, a Mothers' Congress number. We send it out with the hope that there will cling to these pages a little of the enthusiasm and inspiration generated at that great meeting and which should be conducted by every possible channel of spoken or written word to the homes of the whole land.

The matter of continuing the paper is still undecided. We desire to thank most heartily those who have responded to the "Personal Letter" in the January number. It is very gratifying to know that so many have a good word for the paper. An author writes: "Whatever the outcome, you have at least made a creditable showing for the time and effort you have given to the venture, and I trust that it will give you some degree of satisfaction if nothing more, as a recompense for your effort." Many letters of similar import have come to the office, all accompanied by pledges either of subscriptions or money.

Mrs. Mary Traffarn Whitney, the founder and editor of *Familyculture,* lives today in North Weare, New Hampshire.

The proof of this article was sent to Mrs. Whitney, with a request that she give the readers of the *Journal* some of the details of the publication of *Familyculture.* Her interesting reply follows:

My dear Mr. Cook:

On reading your letter I felt that having been dead and buried for thirty years I am now resurrected. It really is quite a wonderful experience and I want to thank you. It is all very unexpected and gratifying. It was only a year ago that I learned of the existence of the various eugenic organizations now at work and it was a great joy to know that the little effort I put forth which ended in such apparent futility is now being carried forward by persons well equipped for the enterprise.

It is a satisfaction to hear that my work as far as it went was on the right line in its relation to the present status of the movement. I think *Familyculture* had something less than four hundred subscribers and I was too poor to take the chance of starting into another year with only a small salary to back it up. From the practical financial point of view it was a crazy thing to start it at all but Edward Everett Hale used to say that no movement of importance ever got started that didn't have a crazy man at the head of it.

I was at that time pastor of the Second Unitarian Church of Somerville, Mass. (a suburb of Boston). Being the first woman minister to be called to a near-Boston pulpit, the papers gave me a great deal of free advertising. I was always much more interested in social questions and family problems than in theology and my sermons always reflected that interest which explains the fact that the Somerville and Boston papers printed a lot of them in full—a most unusual thing for papers to do.

A man by the name of J. Winfield Scott had been attracted to my services who was in sympathy with my general line of thought and it was with him that the Familyculture idea originated and also the word. He pounced upon me as the right person to

THE EDITOR OF FAMILYCULTURE

Figure 16

Dr. Mary Traffarn Whitney, who undertook the publication of the pioneer eugenics Journal in 1896.

head the movement. The idea appealed to me and you know the rest. I did not dare edit a paper which should be under the control of the organization as the subject was such a delicate one and so that was wholly my personal enterprise. But be as careful as I might I came under criticism, and it proved to be detrimental to me, professionally, but that I can see now was to have been expected. I continued in the ministry and preached for thirty years. Ten years ago I gave up preaching and bought this old New Hampshire farm to hide away on and my son carries on a hen ranch here and is interested in breeding experiments. I inclose a photograph which was taken just about the time I was editing the paper, which will probably be quite as satisfactory as one taken later, which I have not in my possession.

You ask me how prospects of racial betterment seem "thirty years after," and to me there are several grounds for encouragement in the midst of what often looks like social and moral chaos.

First is the spirit of internationalism. The apparent increase of this spirit seems to be the one good result of the World War. Among the peoples of all nations there is developing a sense of human solidarity. This it seems to me promises much for race betterment for it works directly to eradicate war, which is from a biological point of view an effective method of selecting the best specimens of men for injury and destruction leaving the poorer ones for propagation. This makes directly for race deterioration. For the first time in history there is serious consideration the world over of methods for abolishing war.

Another effort for the first time in history to do away with an influence which directly attacks human development is the move to abolish alcoholism. Throughout all the civilizations of the world many of the men of great genius and power have been destroyed by alcoholic poison and now for the first time a nation has addressed itself to the problem of destroying this enemy of race improvement. At the same time the League of Nations has recognized opium as a race destroyer and made a start in the direction of breaking up the opium traffic.

Another encouraging sign is the recognition of the necessity for taking such care of mental defectives as will insure that they shall not reproduce their kind and the fact that several states have taken such precauionary measures.

These are encouraging signs from the point of view of eugenics. Again, we are much puzzled and disturbed by a sort of sex madness which seems to have attacked the world but that may possibly be a transition step from the old prudery which was quite probably only a camouflage which being thrown off reveals what was present all the time and which combined with our new freedom gives us what we are shocked to see in sex relations.

The favorable side of this situation is that the old "conspiracy of silence" has disappeared and the way is open for a frank discussion of sex problems which may lead to better understanding which when attained will form a basis for general education relating to sex life. And so much that we see and disapprove of may eventuate in better sex relations.

Our civilization has certain gains which no civilization of the past has possessed which may pull us through and save us from extinction. We have done away with slavery; we have more extended education and women have a status which they have never before acquired.

To my mind the most discouraging feature of our time is its money madness, which has created a power which controls legislation and corrupts the courts thus making real democracy impossible. But even here there is a gleam of hope in the industrial unrest. We cannot look for great race betterment until the conditions of life for

all are as good as they now are for the few and that can never be until we have better industrial and economic arrangements.

From eugenic considerations the child of the coal miner who is suffering from industrial insecurity is as important as any child born. When we try to balance the hopeful and the discouraging phases of the present hour it is not an easy task but to comfort our own spirits and strengthen our own souls for the work in hand we have to give full credit to the forces that are building.

Yours sincerely,

MARY TRAFFARN WHITNEY.

An Outline of Evolution

THE recent eruption and continuous legislative furor in the Fundamentalist belt over the teaching of evolution has served the useful purpose of awakening the interest of the whole country in this fascinating subject. Thanks to the enlightened legislatures, books on evolution should enjoy an increasing patronage for many years to come and none deserves a wider audience than Professor Holmes' treatise.*

Containing 449 pages, 227 illustrations, an index and a carefully prepared glossary this book has the excellent merit of selling for only $3.00. The title "Life and Evolution" encompasses the subject, with about half the volume devoted to structure and function, the remainder treating of heredity, evolution and eugenics. The reader will renew his acquaintance with the Jukes and Kallikaks which emphasizes how slowly progress is made in the study of human heredity.

Although the subject matter has not been sugar-coated for newspaper taste it is readily understandable by all whose interest is more than casual. Prepared especially for college students not specializing in biology, it presents the salient arguments and basic facts in a manner that should appeal to all intelligent readers.

To each of the eighteen chapters, into which the book is subdivided, is appended a short list of references to original sources thus encouraging the serious reader to seek further amplification.

A book of this type will soon be indispensable for all those educated at public expense in states where the exercise of the intellect is regarded as a sin against God. Educators in those sections dominated by mediaeval minds are warned that Professor Holmes is frankly skeptical of the world's having been created in 4004 B.C. and has included in his book all the proscribed doctrines, not omitting the close affinity of man and the apes.

J. H. K.

*S. J. HOLMES. Life and Evolution. Harcourt, Brace & Co., New York. 1926. $3.00.

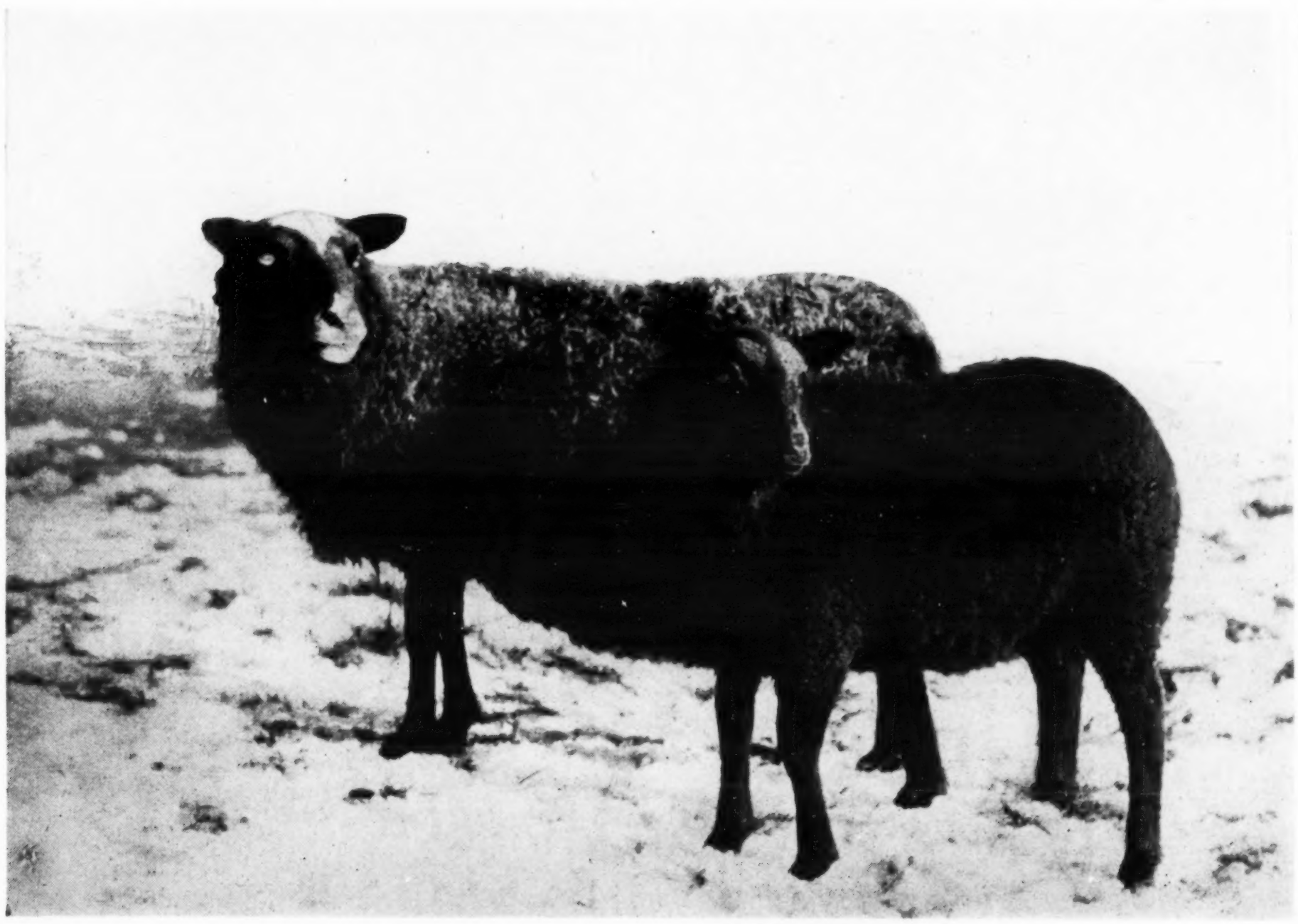
Bring Up a Child

INTELLIGENT PARENTHOOD. Pp. 326. University of Chicago Press, 1926.

This volume contains the proceedings of the Mid-West Conference on Parent Education, March, 1926. While some of the papers are manifestations of the author's desire to sit on the stage, the majority of them are rich with thought and fact, and no parent can read the book without profit—probably a great deal of profit. Although heredity gets a little less than its due, there is something to be said for the remark of one of the speakers, that in a meeting of parents the child's inheritance has to be regarded as an accomplished fact. There it is: the thing to do is to make the best of it.

P. P.

A TWENTY-ONE-YEAR-OLD EWE



HER THIRTY-FIFTH LAMB

Figure 17

THERE has been reported to the Animal Breeding Research Department, University of Edinburgh, a remarkable case of an aged ewe giving birth to what was probably her 35th lamb. She is the property of Mr. James Gray, Horroquay, Tarray, Orkney, Scotland. She has always been a pet sheep, being of the native Orkney breed and possessing a black fleece with white markings on the face. There can be no mistake about her age, for a letter is still in the possession of her owner showing that he bought her in the year 1906 when she was one year old and had a lamb, four days old, by her side. She is now (October 1926) twenty-one years old. She is still brisk though without teeth. The lamb she has brought up this year is by a cross-bred Border Leicester ram—"the prettiest lamb she ever had; it is not one bit native-like." It is black all over.

A. D. Buchanan Smith.

BARLEY IN EGYPT BEFORE WHEAT

THE evidence for the use of barley by the early Egyptians of the pre-dynastic period is summarized by G. Elliott Smith, in *Nature* of January 15, 1927, in a communication entitled "The Beginning of Agriculture."

Referring to the investigation of an early pre-dynastic site in 1901 Professor Smith says, "I recovered from the alimentary canals of a large number of bodies the food that these people had consumed about sixty centuries ago." The study of this material by German specialists in pharmacognosy did not reach a definite conclusion till 1921. The diagnosis of wheat could not be established in a single case, "whereas there is ample evidence that barley was present in most of the specimens." The discovery is recognized as "of extraordinary interest and importance for it definitely establishes the fact that the pre-dynastic people did not eat wheat. The number of specimens is so great that such an assertion can be made with complete confidence. The earliest example of *Triticum dicoccum* appears to be that found by Borchardt in the foundation at the west end of the offering-granary in the temple of King Sahure of the fifth dynasty. Dr. Cherry and others have pointed out, however, that it may have been in use in earier dynastic times."

Accordingly the culture of barley is claimed as the beginning of agriculture, on the strength of recent archaeological indications that the remains of the early pre-dynastic period of Egypt are older than any remnants of ancient civilization in the valley of the Euphrates. This is thought to establish definitely the priority of Egypt as the exclusive center of early civilization.

If, then, the early pre-dynastic evidence reveals the presence of cereals and suggests that agriculture was then being practiced, we have positive evidence of the most significant kind that civilization began in Egypt. We know also that people in Egypt at this time, many centuries before the metal copper was known, were using the copper ore malachite, which there is every reason for believing was obtained from the Wady Alaqi in Nubia. These and scores of other facts to which I have been constantly directing attention, in season and out of season, during the last fifteen years, establish on a firm foundation the certainty that civilization, not merely agriculture and the working of metals, customs and beliefs that go to the making of early civilization, were first invented in the Nile Valley.

The fact that the alimentary canals of all those earliest Egyptians contained barley is surely certain evidence that barley was growing in Egypt at that time. Whether it was indigenous or not we have, of course, no direct evidence to prove, because every foot of land that can be cultivated in the Nile Valley has been turned over countless millions of times during the last sixty centuries by an unbroken series of *fellahin*. But the fact that wild barley is found in the northeast corner of Africa, both on the Mediterranean littoral and in the regions to the south and east of Egypt, suggests that it was also growing in the Nile Valley when men first made their way into that strip of land.

The only alternative is to assume that the earliest Egyptians brought barley into the country with them. I need scarcely say that this is a mere speculation, in support of which there is no evidence of any sort, not even a suggestion of its likelihood. The conclusion that is forced upon us is that the earliest settlers in the Nile Valley found barley growing there in a wild state and made use of this natural food supply. Living under such ideal conditions, the population, in course of time, increased to such an extent that the natural supply was inadequate to support them. Then it can be assumed men imitated the natural processes which they had watched year by year for unknown centuries, and by extending the area of irrigation instantly devised the art of irrigation and the invention of agriculture. This is the only reasonable interpretation of a vast mass of evidence.

A different line of argument could be projected, of course, from the indications that wheat was brought into Egypt by the dynastic people who were more advanced than the pre-dynastic Egyptians. Since it is known that the dynastic people came into up-

per Egypt from the East and brought a higher civilization with them, a source of civilization outside of Egypt is indicated. The priority of Egypt is open to question, even on archaeological grounds. Biological objections to considering the Nile Valley as an original seat of agriculture or center of plant domestication are stated in a recent article in this JOURNAL on "Peru as a Center of Domestication."*

Instead of accepting the Nile Valley as the original home or place of development of the wild barley, it seems more probable that the natural condition of the overflowed lands was that of a tropical swamp with watercourses blocked by papyrus, and inhabited by crocodiles and hippopotami. Agriculture may have had several beginnings, but if there was only one beginning it probably was not in Egypt, but is more likely to have been in Peru.

The ancient monuments of Egypt with the changeless climate and sixty centuries of *fellahin* in "an unbroken series," convey, even to the scientific investigator, an almost superstitious veneration of antiquity. But this feeling must be shaken off, or at least held in suspense, if there is to be any real biological study of the problems of early development of civilization, as based on agriculture. The time for any scientific certainty probably is far in the future. Only a few of our present day investigators and writers on primitive civilizations recognize the relation to agriculture or appreciate the biological factors of the agricultural problems. Indications of longer domestication of plants in America than in the "Old World" have received little consideration from Egyptologists and Assyriologists.

The way of such knowledge has many strange pitfalls where mistakes are so easily made even in matters that seem obvious and self-evident to Professor Smith. Thus the eating of barley by the prehistoric Egyptians does not *prove* the growing of barley, and the growing of barley would not *prove* the domestication of barley, at a particular place or by a particular people. The wild species of barley are numerous and widely distributed in the Mediterranean region and in Western Asia, and might have been domesticated in any part of their natural range, or they might have been used without being cultivated. The wild rice of eastern North America, *Zizania aquatica*, was an important food product among many tribes of Indians but was not cultivated. Many tribes of Indians in California had no agriculture, but regularly harvested and stored the seed of grasses and other plants, for grinding into meal.

Any biological fact like the sequence of barley and wheat in Egypt is likely to be significant, and it is interesting to consider what each fact may mean. Speculations that arouse interest and stimulate further study are useful, but too many inferences from one fact weaken confidence in our procedure, and tend to obscure the facts rather than to clarify their relations.

O. F. Cook.

*COOK, O. F. Peru as a Center of Domestication, *Journal of Heredity*, Vol. XVI, Nos. 2 and 3, pp. 33-47, 95-110.

———— Wild Wheat in Palestine, *U. S. Dept. Agr. Bull. No.* 274, Jan. 21, 1913.

———— Milpa Agriculture a Primitive Tropical System, Smithsonian Report for 1919, pp. 307-326.

See also two interesting short communications by John Percival and Harold J. E. Peake in *Nature* of January 29, 1927, discussing Professor Smith's article on "The Beginning of Agriculture," and pointing out that emmer and *turgidum* wheats have been found in many ancient sites in Egypt, while the *vulgare* wheats are believed not to have appeared in Egypt until Roman times.

ORIGIN OF THE GARDEN STRAWBERRY*

A. J. MANGELSDORF
Harvard University, Bussey Institution

THE strawberry appears to have been almost completely ignored by the ancients, if one may judge from the failure to mention it in their literature. Sturtevant,[10] who has given us a detailed account of its classical history, found no mention of the fruit in the writings of the early Greeks. Virgil, Ovid and Pliny refer to the plant, but say nothing of its use as an article of diet. More unexpectedly still, Sturtevant discovered no reference to it in the "cook book" of Apacius Coelius, who was supposed to have lived about A. D. 230, nor in the "unusually full and complete treatment of garden, orchard and field products" by Ibnalawam, an author of the tenth century, "nor in *The Forme of Cury*, a roll of ancient English cookery compiled about A. D. 1390 by two master cooks of King Richard II, nor in *Ancient Cookery*, a recipe book of 1381." It is mentioned in several of the sixteenth century herbals, however, and Fletcher[4] quotes Hyll as saying in his "Gardeners' Labyrinth" (1593) that "they be much eaten at all men's tables in the summer time with wine and sugar, and they will grow in gardens until the bigness of the mulberry."

From the scantiness of reference to it, one must conclude that the strawberry received but little attention until the beginning of the seventeenth century, nor is it strange that this should have been the case. Only three species, *Fragaria vesca*, *F. collina* and *F. elatior*, are indigenous to Europe. All of these species are small-fruited and, though not unpalatable, they lack the flavor and aroma which characterize the American species, *F. virginiana* and *F. chiloensis*.

Introduction of American Species

It is quite likely that the use of the strawberry as a common article of food in the New World antedates its use in the Old. Frezier, who introduced *F. chiloensis* into Europe, found it in fields on the west coast of South America as early as 1712. In a letter to Duchesne[3] (p. 181) he states that: "ils rapportent si abondamment à la ville de la Conception & aux environs, qu'on les vend au marche, comme les autres fruits."

The early New England colonists found the aborigines utilizing the common wild species of that region, *F. virginiana*. Roger Williams, according to Fletcher[4] wrote that the Indians "bruise them in a mortar and mix them with meals and make Strawberry bread." The American species found immediate favor with the early settlers. Fletcher quotes Ralph Hamor as describing "great fields and woods abounding with strawberries, much fairer and more sweete than ours," and an unnamed colonist as writing to his friends in England that the berries were "four times larger and much more exquisitely flavored" than the wild strawberries of England. The size appears to have been somewhat exaggerated, but the comparison as to flavor can hardly be disputed.

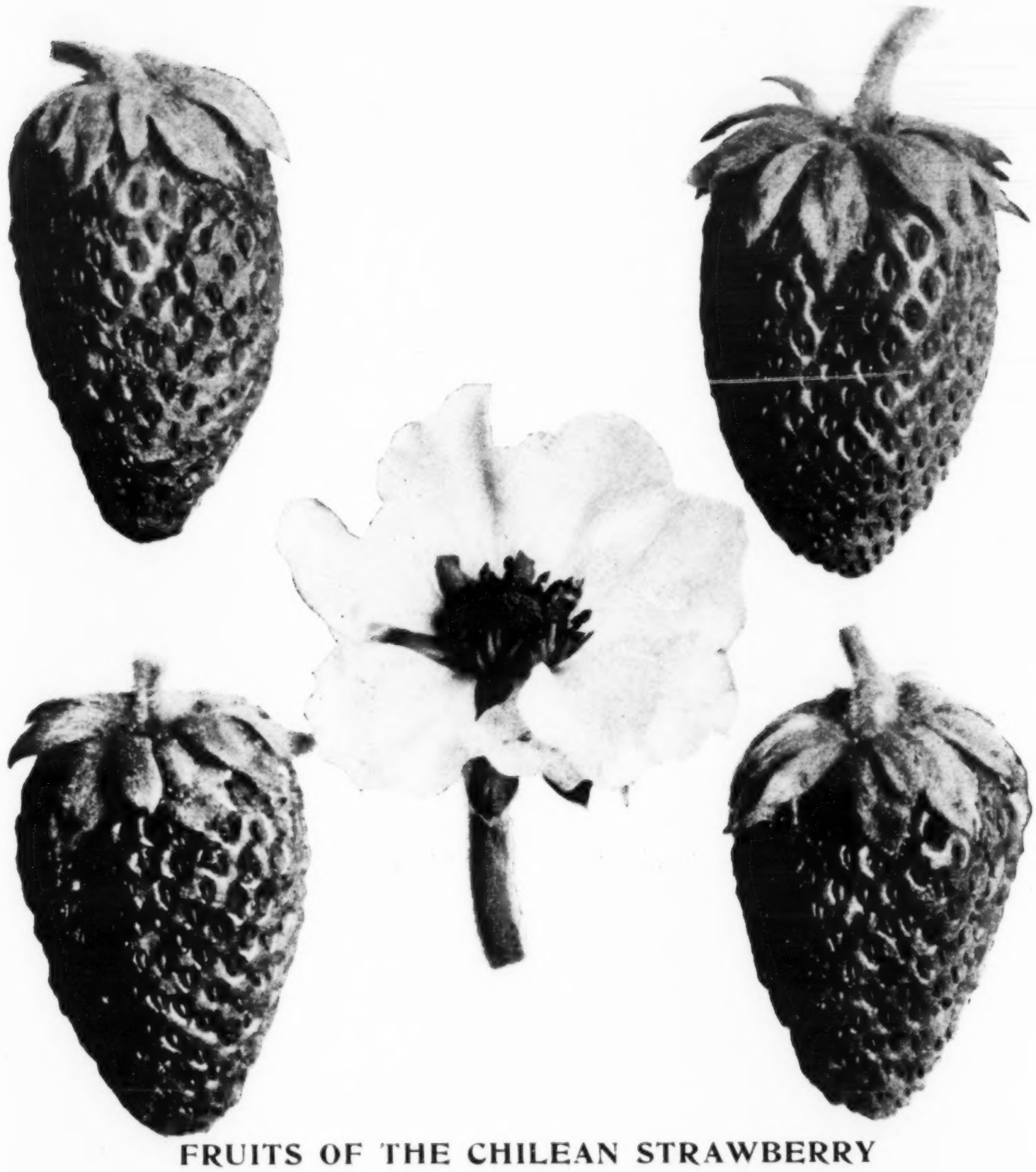
F. virginiana was immediately introduced into England where it became widely known under the name of Scarlet or Virginian strawberry. Because of its excellent flavor it rapidly attained popularity and was widely cultivated in gardens. As already mentioned, the first plants of *F. chiloensis* were brought to France from Chile by A. Frezier, a French army officer. According to his account, the ship's supply of water was almost exhausted before the continent was reached, and he was obliged to use a part of his own allowance for the plants. Only five survived. Two of them Frezier gave to Monsieur Roux de Valbonne, nephew

*Contribution from the Laboratory of Plant Genetics, Harvard University, Bussey Institution.

A FIELD OF CHILEAN STRAWBERRIES NEAR AMBATO, ECUADOR

Figure 18

Probably due to the equitable climate *F. chiloensis* bears all the year in this region, with heavier crops of berries in February, August, and December. The species was introduced into Ecuador some time after the Conquest, and today the strawberry plantations in the region of Ambato are the largest in South America. The ground is a very sandy volcanic loam, and the plants are not irrigated. Photograph by Wilson Popenoe, courtesy of Office of Foreign Seed and Plant Introduction, U. S. Department of Agriculture.



FRUITS OF THE CHILEAN STRAWBERRY

Figure 19

The Chilean strawberry contributed two important characteristics to the garden type—size, and firmness of flesh. None of the garden varieties equal the chilean in the latter characteristic, as in Ecuador the fruits are handled more as we handle apples, being gathered in large boxes and shipped considerable distances by mule and rail without crushing the fruits. Photograph by Wilson Popenoe, courtesy Office of Foreign Seed and Plant Introduction.

of the brothers Bruny, the owners of the vessel, one he gave to M. Antoine Jussieu to be planted in the Royal Garden, another to M. le Pelletier de Souzy, minister of fortifications, and one he retained for himself.

The plants apparently prospered in their new environment and the species was soon disseminated throughout Europe. It met with little enthusiasm, however, since it did not preserve its native fruitfulness in Europe. The reason for this anomaly was discovered by Duchesne: all the plants were pistillate and incapable of self-fertilization. When grown together with *F. virginiana* and *F. elatior* the plants bore well, but presumably this fact was not generally known.

The Large-Fruited Type

It was not until the middle of the eighteenth century, a number of years after the introduction of *F. chiloensis* into Europe, that the large fruited garden type first appeared. It was designated *F. grandiflora* by Ehrhardt,—a name which we may use as a matter of

THE VIRGINIA STRAWBERRY

Figure 20

Plants of *F. Virginiana* growing wild near Washington, D. C. The Virginia Strawberry was enthusiastically spoken of by the early colonists, and it was very soon introduced into Europe, where its superiority to the European species rapidly gained it a wide distribution. Photograph courtesy of George M. Darrow, U. S. Department of Agriculture.

FRUITS OF VIRGINIA STRAWBERRY

Figure 21

The large fruited garden varieties of strawberries are believed to have arisen from crosses between the two American species, the Chile and Virginia strawberries. This *grandiflora* type first made its appearance in France about 1750, and it is noteworthy that two American species should have crossed the Atlantic to produce the fruit about which a famous divine made the remark: "doubtless God could make a better fruit than a strawberry but doubtless God never had."

convenience. The nature of its origin was unknown, but various explanations were advanced: one that it had been brought from Surinam (where Fragaria is not known to be indigenous), another that it was imported from Carolina. Duchesne, with remarkable acuteness, suspected that it had originated from a cross between *F. chilocnsis* and *F. virginiana,* possibly in the vicinity of Brest, where both species had been under cultivation for some time.

The evidence which has accumulated since Duchesne's time points to the correctness of his theory. The *grandiflora* group, as we know it today, displays a wide range of variation, but in all characters except size and robustness it is more or less intermediate between *F. chilocnsis* and *F. virginiana.* These forms cross readily with each other and produce fertile hybrids, and both Longley[6] and Ichijima[5a] find that each has 28 pairs of chromosomes. All garden varieties thus far investigated have been found to possess 28 pairs of chromosomes also.

The conclusions of Duchesne as to the origin of the garden type have been quite generally accepted. A few workers, however, have held other opinions. Bailey[1] believes it to be pure *F. chilocnsis* modified by culture and by a new environment. He bases his conclusions

Plants of *F. Virginiana* growing wild near Washington, D. C. The Virginia Strawberry was enthusiastically spoken of by the early colonists, and it was very soon introduced into Europe, where its superiority to the European species rapidly gained it a wide distribution. Photograph courtesy of George M. Darrow, U. S. Department of Agriculture.

Figure 20

on observations which he made on plants of *F. chiloensis* which he obtained from Oregon and which, after several years, showed marked changes in their habit of growth. He summarizes his arguments in the following words:

> There is only one conclusion, therefore, which fully satisfies all the demands of history, philosophy and botanical evidence, and this is that the garden strawberries are a direct modification of the Chile strawberry. The initial variation occurred when species were thought to be more or less immutable, and, lacking exact historical evidence of introduction from a foreign country, hybridization was the most natural explanation of the appearance of the strange type. This modified type has driven from cultivation the Virginian berries, which were earlier introduced into gardens; and the original type of the Chilean strawberry is little known, as it tends quickly to disappear through variation when impressed into cultivation. The strawberry is an instance of the evolution of a type of plant, in less than fifty years, which is so distinct from all others that three species have been erected upon it, which was uniformly kept distinct from other species by the botanists who have occasion to know it best, and which appears to have been rarely specifically associated with the species from which it sprung.

Bailey's theory has not been generally accepted. The presence of virginiana-like characters in the garden type is too obvious to be disregarded. Furthermore, it fails to give due consideration to the circumstances under which the *grandiflora* type appeared. There can be no doubt that this type originated in Europe, and it is unanimously agreed that it shows *chiloensis* heritage. Duchesne's account, however, indicates that all the existing *chiloensis* plants in Europe at the time were pistillates, and incapable of self-fertilization. If *grandiflora* came from *chiloensis* parentage, it must necessarily have been through crossing. It is known to have been grown in gardens together with *vesca, elatior* and *virginiana*. The first two have been found by us to give sterile hybrids with *chiloensis*, while the latter gives hybrids which are vigorous and fertile, and which approximate quite closely the *grandiflora* type.

Sturtevant[10] believed *F. vesca* and *F. elatior,* as well as *F. virginiana* and *F. chiloensis,* played a part in the development of the garden type. He states his views as follows:

> The modern varieties under American culture usually have large berries with more or less sunken seeds, with the trusses lower than the leaves, and seem to belong mostly to the species represented in nature by *F. virginiana,* although there are supposed hybridizations with *F. chiloensis* and, in the higher flavored class, with *F. elatior.* Certain it is that in growing seedlings from our improved varieties reversions often occur to varieties referable to the Hautbois and Chilian sorts, from which hybridization can be inferred. I have noted as of common occurrence that seedlings from high-flavored varieties are very likely to furnish some plants of the Hautbois (*F. elatior*) class, and even scarcely, if at all, distinguishable from named varieties of the Hautbois with which there has been opportunity for close comparison. From large berried varieties of diminished flavor, and which occasionally throw hollowed berries, the reversion ocassionally produces plants unmistakably of the Chilian type. In other cases we have noticed reversions to forms of *F. vesca.* These circumstances all lead towards establishing the mingled parentage of our varieties under cultivation, and render the classification of cultivated varieties somewhat difficult.

A similar view is expressed by Richardson[7] when he says:

> Something of the origin of the modern Garden Strawberry is known, but its whole history is not. It springs from an old form of Garden Strawberry, the results of crosses between *vescas,* Alpines and Hautbois. This older form was again crossed with *F. virginiana,* introduced in 1629, and *F. chiloensis,* introduced to Marseilles in 1712 and to England in 1727 by Philip Miller.

Cytological and Genetic Evidence

That *F. vesca* and *F. elatior* have played a part in the development of the garden type appears extremely doubtful in the light of their chromosome numbers and their breeding behavior. *F. vesca* has 7 pairs of chromosomes, and *F. elatior* has 21 pairs, while all of the varieties of the garden type thus far investigated have 28 pairs, as has been stated. Both *F. vesca* and *F. elatior* when crossed with the 28-chromosome forms give hybrids which are almost completely sterile. It must be mentioned

that after several years of observation Richardson altered his views as to the participation of *F. vesca* in the parentage of the garden type. He says[8]: "From crosses made with *vesca* × *Daltoniana,* garden varieties and *chiloensis,* I have never obtained free fruiting plants, and am now very strongly inclined to believe that *vesca* has nothing to do with the present garden varieties."

Robbins[9] in his recent text, "The Botany of Crop Plants," says of *F. vesca*: "This strawberry is a native of Europe, but naturalized in the Eastern and Middle States. It has given us our Perpetual and Everbearing varieties," This is incorrect—the everbearing varieties in cultivation at the present time are all of the *grandiflora* type. *F. vesca* is often described as the "monthly" or "everblooming" strawberry. It is probably from this fact that Robbins drew his conclusion as to the origin of our present everbearing varieties.

One point still to be considered is the change which has taken place in the garden type during the past fifty years with reference to sex expression. In *grandiflora,* as in its parents, *chiloensis* and *virginiana,* there is a marked tendency toward diœcism, the pistillate form being in general much more fruitful than the hermaphroditic form. As Darrow[2] has pointed out, the better varieties grown in this country 75 years ago were pistillates; the hermaphroditic varieties were much less fruitful and were grown principally to provide pollen for the more fruitful pistillate varieties. At the present time, however, the most widely cultivated varieties are hermaphrodites, and they are apparently quite as fruitful as any of the pistillates.

A possible explanation of this situation lies in the inheritance of sex expression in the strawberry. The pistillate form is dominant to the hermaphroditic form; and there is some evidence that pistil fertility is conditioned by a number of factors closely linked to the dominant stamen-inhibiting factor. If these assumptions are correct, then these fruitful hermaphrodites have resulted from a selection of crossover types which carry the factors for pistil fertility as well as those necessary for stamen development.

The evidence, then, as to the derivation of the *grandiflora* or garden type may be briefly summarized as follows: It first appeared in Europe in a region where the pistillate form of *F. chiloensis* and the hermaphroditic form of *F. virginiana* had been grown together in gardens for a number of years. It has the same chromosome number as these species and is fully fertile with them. It differs in chromosome number from *F. vesca* and *F. elatior,* and crosses with these species gives sterile hybrids. The evidence is overwhelmingly in favor of the hypothesis advanced by Duchesne in 1766 that it comes from a cross between *F. chiloensis* and *F. virginiana.*

The better varieties of the present day represent selections in which are combined the factors for stamen development and for pistil fertility, together with a high degree of vigor and robustness, resulting presumably from heterosis and from an accumulation, through selection, of favorable growth factors.

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Sociology and Eugenics

The City: Papers and Proceedings of the 20th annual meeting. American Sociological Society. *Am. Journal of Sociology,* Vol. XXXII, No. 1, Part 2, July, 1926. Pp. 332. Price $2.00.

It is interesting to note, in the contents of this volume, how rapidly sociology is approaching the point of view of eugenics. Many of the papers here published take the eugenic attitude; a number of them are valuable contributions to eugenics. Roswell H. Johnson discusses "The Eugenics of the City," emphasizing the fact that urban life is a destroyer of the best racial values. Hornell Hart, on the other hand, in "The Urban Expectation of Life in 2000 A. D.", argues that within a couple of generations people will live to be at least 200 and will be at their prime when they reach the first century mark—a conclusion with which few evolutionists are likely to agree. Immigration, occupation, public opinion, and many other topics are discussed by specialists. The volume merits wide circulation. *P. P.*

Dairy Herd Improvement Rests on Three Practices

THREE ways of improving the dairy herd—better feeding, rigid culling, and intelligent breeding—were emphasized by J. C. McDowell, dairy husbandman of the United States Department of Agriculture, in a talk at the recent farmers, week at Orono, Me.

Better feeding of the cows we now have, he said, increases average production, increases total production, and usually increases net profits. Rigid culling out of low producers increases average production, increases total production, and nearly always increases net profits. The use of better sires eventually increases average production, increases total production and, I believe I may safely say, with proper management always increases net profits.

All dairy herd improvement due to better breeding tends to increase profits to the producer and to decrease costs to the consumer. It is one of the ways by which the world may become richer without decreasing the prosperity of any individual. Therefore, as I see it, the breeders of good purebred dairy cattle are among the world's greatest benefactors.

It is a common practice to select dairy bulls on their appearance and their pedigree. The day is coming when dairy bulls will be selected on appearance, pedigree, and progeny. The production records of a large number of daughters of a dairy bull when compared with the production records of their dams determine the breeding value of the bull as certainly as the records show the producing ability of the cows themselves. If a sire has a high producing dam he may transmit high production to his daughters, but if he has already transmitted high production to every one of his first 5 or 10 daughters it is a practical certainty, not that he may, but that he will transmit high production on an average to all his offspring. The record of the dam of any dairy sire is a promise, but the record of a large number of high producing daughters is the fulfillment of that promise.—*U. S. Dept. Agr.*

THE INHERITANCE OF "FACIAL SPASM"

And the Effect of a Modifying Factor Associated with High Temper

JOSEPH B. GOLDSMITH
Oklahoma University

DURING the past decade there has been a small dispute among medical men regarding the usage of "Tic," and "Spasm." However, in the past few years this point has probably been settled by the excellent work of Charcot and other French workers leading up to the publication by Meige and Faindel in 1907 of "Tics and their treatment."

At the present writing the word "Tic" is applied to that form of facial twitching which is due to a peculiar mental condition. It is never beyond the control of the subject, is executed by him as a distinct voluntary action and is followed by a certain amount of mental satisfaction.

A "Spasm," on the other hand, is never under the control of the subject, being executed during sleep as well as when awake. It is probably due to some irritant in the reflex spinal or bulbo spinal arc, and does not produce any mental satisfaction to the subject.

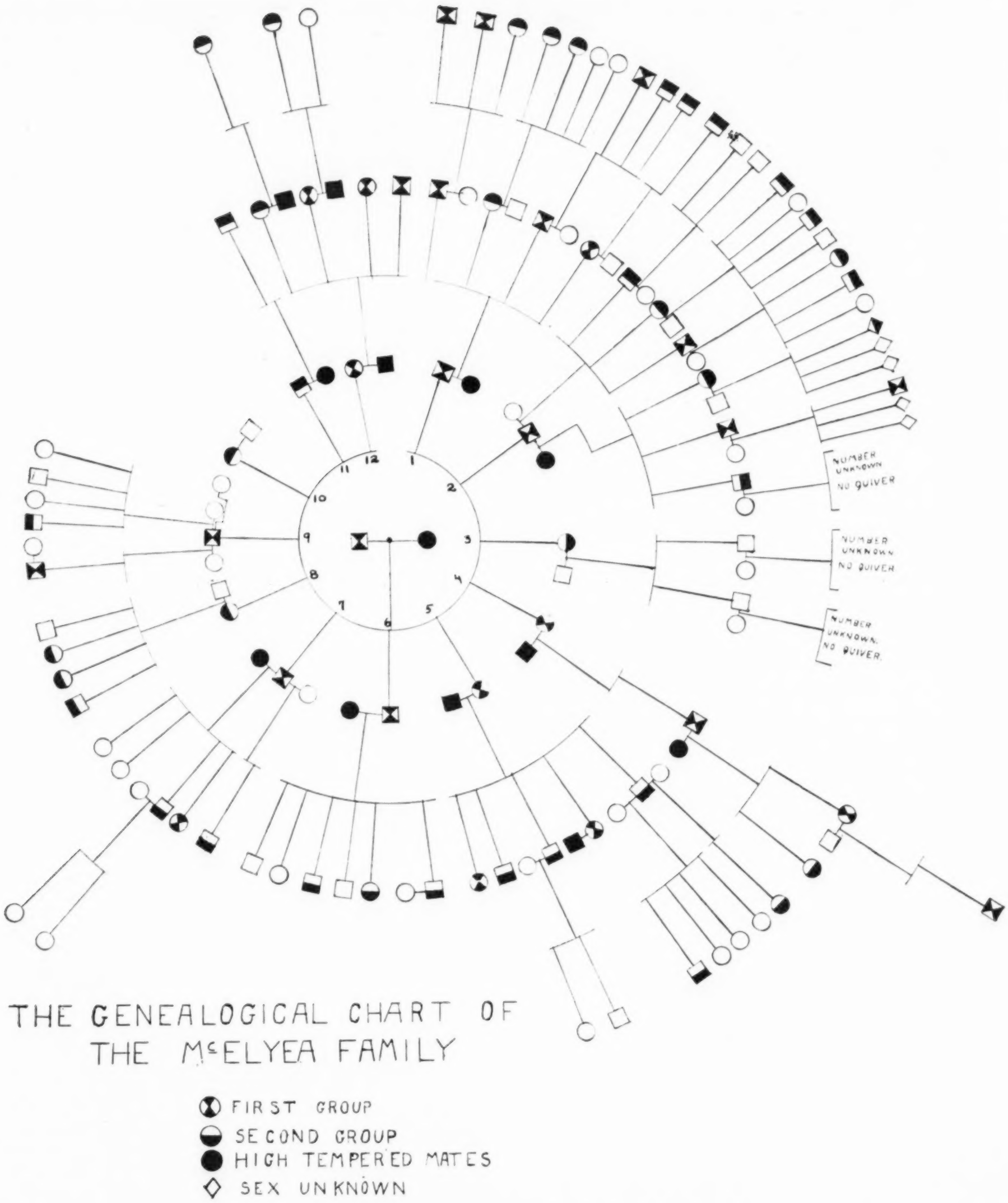
In going through the literature I have found only one record of the inheritance of a facial spasm and that by Dr. Percy Stocks. He reports a Polish family in which a facial spasm has been inherited for four generations. His report shows that of the 13 affected individuals, 8 are females and 5 are males, a proportion which he says agrees with Gower's statemen that nervous diseases occur predominately in females, showing a ratio of 2 females to every 1 male affected. He also shows a skipping of two generations with the affection reappearing in the third generation in three-fourths of the offspring.

The case which I shall now describe appears to demonstrate the hereditary transmission of a nervous condition more completely than any case yet described.

A common saying about this family is, "You can tell he is a McElyea by the way his chin jumps." While I shall refer to this character as the quivering chin, it is in reality only the fleshy part of the chin that is affected. The central point of activity is at about the same place as a common chin dimple, and if the subject has a dimple the seat of the quivering seems to be at the bottom of the dimple whorl. The character is not prominent except in the extreme cases where it is so noticeable as to be seen by the casual observer.

Since all do not exhibit the same amout of quivering I have divided the character into two groups of different intensity, placing those with chins that quiver all the time in the first group, and those whose chin quivers only when they are angry or excited in the second group. The inheritance of this character seems to be affected by mating with high tempered mates who evidently carry a modifying factor with intensifying action, so I have indicated the high tempered mates on the genealogical chart.

Figure 23 is a chart showing the theoretical action of the factors whereby the demonstrated ratios could be possible. *C* is the stronger dominant factor which is shown somatically as a second group individual without the action of the intensifying factor, *T*. *A* is the weaker dominant factor which is not shown without the action of *T*, and *T* is the factor for high temper that acts as an intensifying factor in this instance. The normal

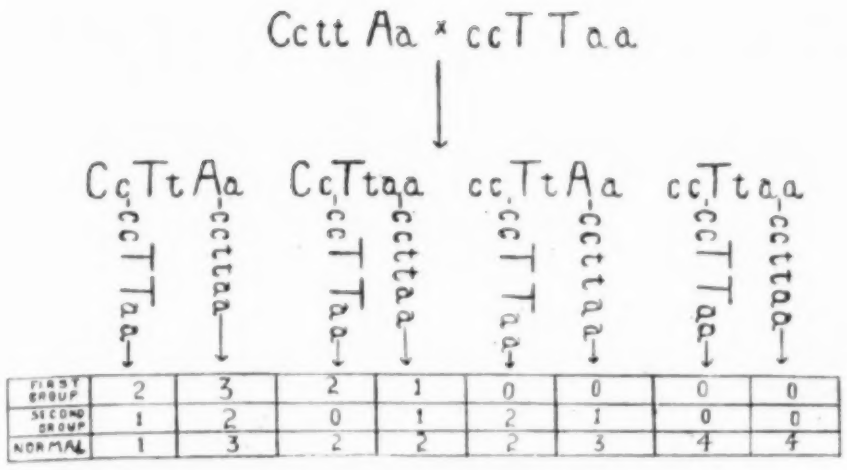


THE GENEALOGICAL CHART OF
THE McELYEA FAMILY

INHERITANCE OF FACIAL SPASM

Figure 22

The symbols distinguish the two types of facial spasm. The more pronounced form is most frequently found in the progeny of high tempered individuals.



THEORETICAL EXPLANATION OF INHERITANCE

Figure 23

Showing the action of the principal factors *A* and *C* and the modifying factor *T*.

TYPES OF MATINGS	TYPES OF OFFSPRING	ACTUAL NUMBER OF OFFSPRING	THEORETICAL RATIO
⧗–●	FIRST	20	2
	SECOND	16	1
	NORMAL	7	1
⧗–○	FIRST	8	4
	SECOND	10	3
	NORMAL	3	6
◒–●	FIRST	0	0
	SECOND	2	1
	NORMAL	0	1
◒–○	FIRST	0	0
	SECOND	10	1
	NORMAL	18	3

ACTUAL DISTRIBUTION OF CASES

Figure 24

Showing types of mating and actual and expected distribution of offspring.

allelomorphs of the above mentioned factors are *c*, *a*, and *t*.

In any individual where *T* comes in contact with *A* that individual is affected to the degree of the second or less affected group, but if the *T* comes in contact with *C* or *CA* that individual is affected to the degree of the first group; therefore *T* as the modifying factor will intensify either *C*, *CA*, or *A* in the same ratio, but since a *C* or *CA* individual would belong to the second group without the modifying factor, *T* serves only to make the affection stronger, thereby advancing *C* or *CA* from the second group to the first group (*CT*), and since *A* alone would not show somatically, the *T* intensifies it to the second group.

In using the symbols *C*, *A* and *T*, the author is not attempting to set forth the idea that this character is controlled by a single definite gene. The suggested symbols are more nearly intended to represent a given condition of inheritance which may be controlled by one definite gene or more probably by a series of factors.

Figure 24 shows the types of matings, the actual number of offspring of the different types and the theoretical ratio according to Figure 23. With the small number of individuals with which we are forced to work in tracing human inheritance we can not even approach perfection in ratios but the above offered theory comes nearer to fulfilling the requirements than any of the common types of inheritance.

Both males and females alike are affected somatically and either can transmit the disease, so it is neither sex-linked nor sex-limited.

FACTS AND THEORIES IN EDUCATION

A Review

THIS book is the first contribution of the Children's Foundation, an organization "devoted to the study of the child and the dissemination of knowledge promotive of the welfare of children." It contains an enormous amount of information of importance to all who are interested in children. Since the development of good heredity by proper education ranks with the importance of being well born, the book is of considerable interest to eugenists.

There are three main headings: I—Present Status of our knowledge of Child Nature; II—Present Status of our Knowledge of Child Well Being; III—Present Status of our Knowledge of Education. Among the sixteen contributors are many of the leaders in education, sociology and psychology in the United States.

That something is wrong with our school system is recognized. Impressive totals are presented showing the depredations that anti-social individuals are making on human happiness and wealth. Professor Goddard, the author or chapter VIII presents an excellent view of this alarming situation:

> Man's greatest interest is in the children. As usual it is hard to put in practice what we know.
>
> However, something radical must be done because as a group we are losing ground. The anti-social element is increasing and the burden of the insane and feeble-minded is becoming heavier.
>
> The explanation of all this is that we have mistaken symptoms for causes. The cause of crime, insanity and delinquency is not anything so simple as the movies, alcohol or any of the other numerous supposed causes.
>
> The cause is to be sought and found in man's inherited tendencies, which do not fit his present world, and we have not tried efficiently to modify them.
>
> We now know better than ever before the nature of the child, the wide range of capacities in children and the necessity of adapting the training to the nature and ability of the individual child.
>
> We have roughly four groups: the normal or average child from whom our methods and school curricula are pretty well adapted; the subnormal or feeble-minded child who can be made useful but only by special methods; the super-normal child who also is not well cared for in the regular school—he has gifts that should be cherished and cultivated. Lastly we have the sick child—the psychopath or unstable child. We are often making him worse and thereby filling our hospitals for the insane. Perhaps his solution is too simple.
>
> The schools must play the chief role in training the young because the home can not do so effectively. The school must not lose sight of the fact that the making of good citizens is accomplished more successfully by teaching children to control the natural tendency to steal and lie, than by teaching them to read and write. We may continue to do the latter but we must not leave the former undone.
>
> There is much yet to learn but we already know enough, if we put it into practice, to transform civilization within a generation or two.

Can the schools (as at present constituted "play the chief rôle" more effectively than the home? It might be questioned, yet Dr. Goddard's conviction on this point is not as firm as Professor O'Shea's:

> We must in the future accomplish more during the school life of our children than we have been able to do heretofore, and so we must have them under school influences for a larger portion of their time than we have had them in the past. There is no escape from this requirement if we are to meet the new conditions in the world. There is widespread belief that we ought not to make the school day longer than it now is in most places, but in any community which is provided with proper playgrounds, it might be of advantage if they could be placed under the direction of school authorities so that pupils could be subjected to school influences during the entire day. Also,

*The Child, His Nature and His Needs. Edited by M. V. O'Shea, Professor of Education, University of Wisconsin, pp. ix×516. Price $1.00 in the United States. The Children's Foundation, Valparaizo, Indiana, 1925.

if our schools could be all provided with well equipped manual arts and household arts laboratories, pupils might with advantage to their intellectual development and without prejudice to their health or recreation, spend an hour or two in manual and house hold work beyond the regular long vacation. In some cities it would be of advantage to pupils if they could be in school Saturday forenoon instead of being left with nothing to do except to run the streets. School buildings are the most sanitary and healthful places in many communities, and most children are better off in them than they are in their own homes or in the streets. This is not true in all communities but it is true in a great many of them.

If we go to this extreme why not cage up the young of the human species permanently and entirely divorce them from the evil influence of their parents? Why not apply that excellent system in vogue on some Indian reservations and have an annual round-up of young hopefuls, who are thenceforth immured in institutions until their "education" is finished? Perhaps we should consider the depressing results which this has produced before we undertake too drastic an application of Professor O'Shea's method to the newer arrivals in America. Might it be disrespectful to ask whether some of the difficulties our social system is getting into are due to too much school rather that to too little? Many normal children come out with pitifully little to show for the time they have spent. Is the extra investment warranted in view of the meagre returns? Fortunately some of the other contributors present more balanced views of the situation, and emphasize the extreme paucity of really objective studies of education:

For centuries education continued as a matter of tradition and opinion, and because of the recentness of the scientific method, most of our educational knowledge and practice is unsupported by scientific experiment and still is a matter of controversy, debate, and arbitrary decision. The lack of scientific method of attacking education has probably been the most outstanding difficulty in harmonizing knowledge and practice in education.

What the advocates of "more school" do not realize is that the school as at present constituted often fails to prepare for life; that the present overgrown institutions represent an entirely untried experiment in human education. The first contribution of the Childrens' Foundation is perhaps too closely focused on the school system as it is to get a proper perspective. The difficulties are admitted, but the solution seems to be more school, differing in complexity but not in kind. The book fails to make us realize how little we really know about education. It gives the impression that the problem is one of size and application rather than of getting at the facts. That there are alternatives to the present school system is a possibility that might receive greater emphasis. If the experiment is proving to be a failure let's try something else, not make the failure twice as ghastly by doubling its its size.

Man is a social animal, and he has progressed thus far by developing in small groups, heterogeneous as to age, sex, and occupation. For thousands of centuries he grown up in touch with the world about him, he has taken part in its work,—sometimes as a child he has done too much of it for his ultimate good. The process has been by no means perfect, but it has at least achieved a certain social continuity. The experience of one generation was passed on to the next, occasionally an error was outgrown, a discovery made. Now, on very slender evidence we propose to change all this; we segregate youth, unionize the rising generation so that many of them know their parents and their teachers only an necessary evils—taskmasters and food-suppliers. That some of them elect to become parasites on society is not to be wondered at. It is possible that our proud system of stratification has weakened the foundation of society? Instead of investigating the matter, there is the danger that

we will be induced to turn our schools into orphan asylums, thus destroying the last vestiges of social continuity.

Here is a fertile and a fallow field for the Children's Foundation to investigate. Many people agree that something is wrong with society today, but the reasons are complex and obscure. As has been pointed out, causes and symptoms are easily confused. The many "reforms" of our educational system do not recognize the fundamental difficulty—that in some ways the school may isolate rather than educate, and that those queer biological vestiges, parents and a home may have a real place in the economy of the race, for which no institution can quite be a substitute.

R. C.

Civilization and the Decline of Intelligence

CIVILIZATION is the work of the superior men of each race. Consequently the factor of real significance is the individual: the great man is the essential element in the advance of culture; the frequency of genius determines the degree of group success. These individuals of creative and directive genius appear in all races and social classes, but not with equal frequency. The number is determined by the general intellectual level of the group. Certain races, and the upper social strata of all races, contain a larger proportion of persons of superior ability than do other races and social classes. Superiority is a family characteristic, and the intermarriage of the gifted makes more likely the appearance of men of genius. Unfortunately, at the present time there is operative in American life a process of reversed selection and a consequent decline in general intelligence. This is due in part to a large immigration of inferior strains, in part to a "folk-depletion" through urbanization, and in part to the differential fecundity of the social classes.—E. B. Reuter, in review of Hankins, F. H., "The Racial Basis of Civilization." *American Journal of Sociology* 32: 842.

Lectures on Heredity

OUR PRESENT KNOWLEDGE OF HEREDITY, by W. E. CASTLE, C. E. MCCLUNG, J. A. DETLEFSEN, MAUD SLYE, HARRY G. WELLS, and M. F. GUYER. Pp. 242. W. B. Saunders Company, Philadelphia, 1925.

This compilation of lectures dealing with the general problems of heredity, the heredity of sex, the inheritance of acquired characters, heredity in relation to cancer, and eugenics, while not containing anything that is new, is valuable as general reading matter upon the subjects mentioned. The papers were presented as lectures, under the auspices of the Mayo Foundation. It is encouraging that some of the leaders of the medical profession appreciate the importance of "the heredity factor," even though many doctors appear still to be unconvinced.

H. C. M.